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Department of
Agriculture

Forest Service

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Port Houghton/ Cape Fanshaw Timber Sale Project

Draft Environmental Impact Statement

Volume 1

Prepared by

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Contract No. 53-01-9-2-0039
Port Houghton/Cape Fanshaw

United States Department of Agriculture
Forest Service
Region 10
Tongass National Forest
Stikine and Chatham Areas

Reply To: 1950

Date: December 7, 1995

Dear Reviewer:

Enclosed for your review and comment are documents related to the Draft Environmental Impact Statement (EIS) for the Port Houghton/Cape Fanshaw Timber Sale Project. If you received a complete set of documents, the following are in the package:

1. Volume I: Draft Environmental Impact Statement
2. Volume II: Road and Unit Cards

If you elected to receive only the Summary document but would like to receive the Volumes I and II, contact the project leader at the address below.

Volume II may not be reprinted in its entirety for the Final EIS to reduce printing and distribution costs. If you received a copy of Volume II, please hold on to it for your use with the Final EIS. Copies will also be available at local libraries in most communities throughout Southeast Alaska.

There will be a 45 day period during which you may review and comment on the Draft EIS. Comments should be written and must be received by March 11, 1996. These comments should be sent to:

Pam Gunther, Project Leader
Parametrix, Inc.
5808 Lake Washington Blvd. N.E., Suite 200
Kirkland, WA 98033
(206) 822-8880

Two of the proposed timber harvest units exceed 150 acres. Information on these units is provided in the Draft EIS. The required 60 day public notice is running concurrently with this review period on the Draft EIS. Comments on these specific units should be received by March 26, 1996.

The Draft EIS concludes that there is a significant possibility of a significant restriction on subsistence use of deer. Therefore, in compliance with Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA), a public hearing(s) will be held in the vicinity of the Project Area during the public comment period. The date, time, and specific location of the hearing(s) will be announced by future notification in local newspapers and in the Federal Register.

I want to encourage you to take the time to review and comment on the Draft EIS and to participate in the subsistence hearing(s). Your input will be considered in preparation of the Final EIS and the Record of Decision. Your interest in the management of the Tongass National Forest is appreciated.

Sincerely,

Abigail Kimbell

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Port Houghton/Cape Fanshaw Timber Harvest

Draft Environmental Impact Statement

U.S.D.A. Forest Service, Alaska Region
Tongass National Forest, Chatham and Stikine Areas
Juneau and Petersburg Ranger Districts

Lead Agency:
U.S.D.A Forest Service
Tongass National Forest,
Chatham and Stikine Areas

Cooperating Agencies:
U.S. Army Corps of Engineers
Alaska District, Pouch 88
Anchorage, Alaska 99506-0898
U.S. Environmental Protection Agency
22 W. Seventh St., Number 19
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Responsible Officials:
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Abstract: The U.S.D.A. Forest Service (USDA-FS) proposes to harvest from 116 to 123 million board feet (MMBF) of timber in the Port Houghton/Cape Fanshaw project area. The actions analyzed in this EIS are designed to implement direction contained in the Tongass Land Management Plan (TLMP 1979, as amended) and the Tongass Timber Reform Act (TTRA). The Draft EIS describes five alternatives which provide different combinations of resource outputs and spatial locations of harvest units. The alternatives are: (A) no-action; (B) to avoid most harvest activities within one mile of the shoreline; (C) to avoid harvest in areas considered sensitive for fisheries resources; (D) to minimize harvest in areas seen by the small boat traveler and maximize alternative silviculture opportunities; and (E) to select the most productive harvest units with the least amount of road miles.

Reviewers should provide the Forest Service with their comments during the review period of the Draft Environmental Impact Statement (DEIS). This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the Final Impact Statement, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act (NEPA) process so that it is meaningful and alerts the agency to the reviewer's position and contentions. *Vermont Yankee Nuclear Power Corp. v NRDC, 435 U.S. 519, 553 (1978)*. Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the Final Environmental Impact Statement. *City of Angoon v Hodel* (9th Circuit, 1986) and *Wisconsin Heritages, Inc. v Harris*, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the DEIS should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

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Acronyms

Acronyms

%	Percent
AAC	Alaska Administrative Code
AD	Anno domini (In the year of the Lord)
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADGC	Alaska Department of Governmental Coordination
ADNR	Alaska Department of Natural Resources
AHRS	Alaska Heritage Resource Survey
ANCSA	Alaska Native Claims Settlement Act of 1971
ANILCA	Alaska National Interest Lands Conservation Act of 1980
ATTF	Alaska Timber Task Force
BMP	Best management practice
BP	Before present
C	Candidate
C2	Category 2 candidate species
CFR	Code of Federal Regulations
COE	United States Army Corps of Engineers
CZMA	Coastal Zone Management Act of 1976
dbh	Diameter at breast height
DEIS	Draft environmental impact statement
E	Endangered
EA	Environmental assessment
EIS	Environmental impact statement
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
EVC	Existing visual condition
FEIS	Final environmental impact statement
FP	Floodplain
FPA	Forest Practices Act
ft	foot or feet
GIS	Geographic information system
GNP	Gross national product
HCA	Habitat conservation area
ID Team	Interdisciplinary team
KPC	Ketchikan Pulp Corporation
KV	Knutsen-Vandenberg Act
LSTA	Logging system and transportation analysis
LTF	Log transfer facility
LUD	Land use designation
MBF	One thousand board feet
MC	Moderate gradient contained
MDF	Medium density fiberboard
MIS	Management indicator species
MLLW	Mean lower low water
MM	Moderate gradient mixed control
MMBF	Million board feet

MMPA	Marine Mammal Protection Act
MOU	Memorandum of Understanding
NA	Not applicable
NEPA	National Environmental Policy Act of 1969 (as amended)
NFMA	National Forest Management Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
ORV	Off-road vehicle
P	Preservation
RM	Roaded modified
ROD	Record of Decision
ROS	Recreation opportunity spectrum
S	Sensitive
SAI	Sale area improvement plan
SBA	Small Business Administration
SPM	Semi-primitive motorized
SPNM	Semi-primitive non-motorized
SRI/CSE	Stream reach inventory and channel stability evaluation
T	Threatened
T/yr	Tons per year
TES	Threatened, endangered, and sensitive
TLMP	Tongass Land Management Plan
TRUCS	Tongass resource use cooperative survey
TTRA	Tongass Timber Reform Act
U.S.	United States
USBLM	United States Bureau of Land Management
USBOM	United States Bureau of Mines
USDA-FS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VCU	Value comparison unit
VQO	Visual Quality Objective
WAA	Wildlife analysis area
°F	Fahrenheit

Executive Summary

Executive Summary

Overview of Project

This draft environmental impact statement (DEIS) describes five alternatives for timber harvest, road and log transfer facility (LTF) construction, and related activities for a proposed timber harvest in the Port Houghton/Cape Fanshaw area on the mainland of Southeast Alaska. The no-action alternative would result in no timber harvest on National Forest land in the project area. In addition to describing the alternatives, this EIS documents the analyses of the expected environmental, economic, and social effects of each alternative.

Proposed Action

The Chatham and Stikine Areas of the Tongass National Forest propose to harvest approximately 123 million board feet (MMBF) of timber within the Port Houghton/Cape Fanshaw project area. The proposed harvest area is located on the mainland of Southeast Alaska about 80 miles south of Juneau. Associated with the proposed action would be construction of one LTF and 95 miles of road. The timber harvest planned for the project area could include one or several timber sales over a multi-year time period.

Purpose and Need

The purpose and need for the Port Houghton/Cape Fanshaw project is (1) to implement direction contained in the Tongass Land Management Plan (TLMP), as amended (U.S. Department of Agriculture, Forest Service [USDA-FS] 1979a, 1986), (2) to help provide a timber supply from the Tongass National Forest consistent with sound multiple use resource objectives and sustained yield management concepts, (3) to meet annual market demand for the timber industry in Southeast Alaska, and (4) to provide consistent local employment in the wood products industry throughout Southeast Alaska. The Port Houghton/Cape Fanshaw project is expected to provide between 100 and 125 MMBF of timber (net sawlog volume).

The TLMP schedules timber sale preparation for all management areas in the project area. A comparison of the desired future condition for the project area, as reflected in TLMP direction, with the existing condition shows the need to convert

suitable stands of old growth timber to managed productive stands capable of long-term timber production.

Section 101 of the Tongass Timber Reform Act of 1990 (TTRA), directs the USDA-FS "...to the extent consistent with providing for the multiple use and sustained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle." Section 101 of the TTRA specifies that Forest Service efforts to seek to meet market demand are subject to appropriation, National Forest Management Act (NFMA) requirements, and other applicable law. Providing a timber supply from the Tongass for sustained local wood products, industry employment, and related economic and social benefits is an objective of the TLMP, the Alaska National Interest Lands Conservation Act (ANILCA), as amended by the TTRA, and the Ketchikan Pulp Corporation (KPC) long-term contract.

Two indicators of market demands are used here in further defining the need. First, the price of bids for timber in the region remains high. Independent sales continue to sell for more than the appraised value. This reflects the nationwide and world price and demand for timber. Second, there is a demonstrated mill capacity in the region to process the logs, if the supply of timber is available. There is a projected need for the timber volume being considered from this project area for the Forest Service to come closer to meeting an objective of providing a three-year supply of timber under contract to the existing dependent industry, as a means of providing for stability in relation to fluctuating market demand (Morse 1995) There is a substantial component of the Southeast Alaska economy that is dependent on a viable timber industry. Based on these factors, the need for the project is clearly indicated.

Timber made available for harvest under this project may be sold as an independent timber sale or offered to KPC under its long-term sale contract. Any independent timber sales or KPC offerings implemented through this project will also help the Forest Service seek to meet market demand as indicated above. The KPC timber sale contract (USDA-FS 1951, Contract Number A10f-1042) includes the following provisions:

- <u>B0.61 Timber Offering Schedule</u>. Each year prior to February 15, Forest Service, after consultation with the purchaser, shall develop a tentative offering schedule based upon the Tongass National Forest Land and Resource Management Plan, which shall display offering areas and timber volumes proposed for harvest, and the expected NEPA process commencement and completion data for making any additional offerings under the terms of this contract. To the extent authorized by law, offering area(s) may be identified for harvest outside the sale area, as needed to meet sale volume requirements. The tentative schedule shall list sufficient timber volume and schedule commencement of the NEPA process by

offering area(s) to provide purchaser a current timber supply sufficient for at least three years of operations hereunder or until the contract termination date, whichever occurs first, adjusting for the provisions of B0.63. In developing the schedule, Forest Service will consider the production requirements of purchaser's manufacturing facilities.

- B0.62 Specifying Offerings for Harvest. Based upon the tentative schedule and the NEPA process, and consistent with timber sale planning, management requirements, and environmental assessment procedures for independent Tongass National Forest timber sales, Forest Service after consultation with purchaser and completion of the NEPA process, shall specify any additional offerings. Forest Service shall seek to specify sufficient offerings to maintain a current timber supply in all offering areas that totals at least three years of operations hereunder or until the contract termination date, whichever occurs first, and which meets the projected requirements of purchaser's manufacturing facilities.

The maximum average rate per year at which KPC is generally allowed to harvest is 192.5 MMBF under long term contract section B0.52. KPC's average annual harvest rate, obtained from contract records, during the five-year period from March 1, 1989 through February 28, 1994 was 185.4 MMBF per year. Therefore, a three-year supply of timber for KPC's operations under the contract is currently estimated to range from 556.2 to 577.5 MMBF.

As of October 1, 1995, KPC had a current timber supply of approximately 145 MMBF. The maximum volume of timber that is anticipated to be provided to KPC in fiscal year 1996 is about 140 MMBF, 171 MMBF in fiscal year 1997, and 154 MMBG in fiscal year 1998. Assuming the maximum annual average harvest rate of 192.5 MMBG by KPC operations, a timber supply of only 82.5 MMBF would be available at the end of 1996, 61 MMBF at the end of 1997, and 23.5 MMBF at the end of 1998. These levels would fall well short of meeting the objective of specifying a three-year supply of timber volume for operations under the KPC contract, considering ongoing harvest at the projected rate noted above.

There have been suggestions that layout and other actions could be expedited to increase the amounts available from the contract area through 1997. However, the current assessment is that further expediting layout is not feasible, even with significant increased funding,while maintaining a reasonable assurance of quality work. The Forest Service has made efforts to accelerate the preparation of new offerings within the contract area. At present, about 852.7 MMBF in new timber projects are being prepared within the contract area, beyond what is reflected in the 1995-1997 figures presented above. However, because of the amount of time required to prepare new offerings in accordance with applicable laws, none of this volume is projected to be available until after fiscal year 1997. It remains to be

seen how much of the volume in preparation will be cleared through the NEPA process and when it will be available.

Consequently, additional timber from outside the KPC contract area is needed in order to meet the three-year timber supply objective. Sale offerings currently scheduled, undergoing NEPA evaluation, or at some other stage in the preparation process are projected to be needed to help meet the KPC long-term contract and independent sale project three-year supply objectives. If any currently planned independent sales were converted to KPC contract offerings, equivalent volume currently planned for KPC contract offerings would then likely need to be substituted as independent sale offerings in order to meet the projected need for independent timber volume. The first offerings from the Port Houghton/Cape Fanshaw project area could be available in 1998 to help meet either three-year supply objective.

Project Area

The Port Houghton/Cape Fanshaw project area is located on the mainland of Southeast Alaska, 30 air miles northwest of Petersburg and 80 miles south of Juneau. Project area boundaries are from Cape Fanshaw south to the Farragut Bay North Arm, east to about Glory Lake, and north to an area between Port Houghton and Hobart Bay.

Issues

The issues described below were developed from concerns raised by resource specialists, other Forest Service staff, and the public during the scoping process. These issues were used to direct the formulation and evaluation of the alternatives. While many other issues exist, the issues described below were deemed significant for detailed analysis as directed by the NEPA. For the purpose of alternative development, the issues have been grouped into two broad categories: resource issues, and social and economic issues. For each resource, the issue is summarized, followed by approaches that can be used to measure differences among alternatives in this EIS.

The following issues focus on natural resources in the project area that may be affected by implementation of the alternatives. Quantitative measurements can be applied to most of the issues in this group. Chapter 1 describes the issues in more detail.

(1) Timber

What changes may be anticipated in the character of the timber resource?

(2) Alternative Silviculture

To what extent are alternative silvicultural treatments proposed in the project area, and what are the benefits?

(3) Marine Resources

What will be the effect of LTF development on marine resource values?

(4) Wildlife

What change in wildlife habitat capability would occur with implementation of the project?

(5) Biodiversity

What changes will occur in habitat and plant and animal diversity within the project area?

(6) Fish Habitat

What will be the effect of the timber harvest and transportation system development on the fish habitat within the project area?

(7) Physical Resources

What effect will timber harvest have on soil stability?

The following issues focus social and economic values in the project area. These values are best measured in qualitative or dollar terms.

(8) Subsistence

How will timber harvest affect fishing, hunting and gathering opportunities, within the project area?

(9) Cultural Resources

How will both known and unknown cultural resources be protected?

(10, 11) Recreation and Visual

What visual and recreational changes will affect both local and tourist use and enjoyment of the project area?

(12) Economics

What are the basic economic values that can be expected with the project?

Development of Alternatives

Each alternative presented in this EIS represents a different response to the issues discussed in Chapter 1. Four action alternatives were developed that meet the stated purpose and need of the project. Each action alternative consists of a site-specific proposal developed through intensive interdisciplinary discussion and evaluation. The locations of units and roads are based on ground verification of all units and roads considered, along with aerial photo, topographic map, and GIS review. More detailed considerations in the development of alternatives are discussed in Chapter 2.

Alternatives Considered in Detail

Alternative A (No-Action Alternative)

A no-action alternative is analyzed in this EIS, and is a requirement of NEPA. This alternative provides a benchmark for comparison of the action alternatives.

No harvest activities on National Forest lands are planned in the project area for this alternative. Logging is expected to occur on the Goldbelt, Inc. lands in the project area at least until 1997 when harvest on all present land holdings is expected to be completed. Alternative A does not meet the purpose and need of the project as described in Chapter 1. For the most part, conditions that currently exist in the project area represent the no-action alternative.

Alternative B

The primary intent of Alternative B is to minimize shoreline disturbance that could occur to fishing opportunities, subsistence use, visual conditions, cultural resources (both known and undiscovered), and existing recreational opportunities through avoiding most timber harvest within one mile of shoreline areas in North Fanshaw between Sandborn Canal and Robert Islands. Harvest does occur within one mile of the shoreline at East Houghton east of Sandborn Canal and at North Shore near Goldbelt, Inc. lands. Some units further than one mile from the shoreline are also avoided to decrease the amount of harvest area seen. No timber harvest is planned in the Sandborn Canal tributaries. See Table S-1 for a comparison of alternative features.

Alternative C

This alternative avoids the placement of harvest units near areas identified as supporting important salmonid fisheries. These areas include Sandborn Canal, the headwaters of Negro Creek, and most Class I and II streams near shoreline areas between Negro Creek and Sandborn Canal. Timber harvest between Jamestown and Dahlgren peaks is decreased compared to the other action alternatives, and road construction is minimized in this area to avoid disturbance to mountain goat travel between the two peaks.

Alternative D

The primary objective of Alternative D is to minimize harvest in areas seen by the small boat traveler. Six helicopter units and one group selection area are planned at East Houghton where up to 50 percent of the overstory volume would be removed. Considerable harvest is planned in North Shore due to the existing visual conditions from the Goldbelt, Inc. land holdings. More alternative silviculture treatments (49 percent) are planned compared to other alternatives. Consequently, to achieve the required volume, more units and acres would be subject to harvest. The most helicopter logging and least road miles are planned for this alternative, which results in a higher cost for this alternative.

Alternative E

The objective of this alternative is to select the most productive harvest units with the fewest road miles to allow the most optimum appraisal for the project area. This alternative most closely resembles the original proposed action after refinements based on field verification. Units are located in Sandborn Canal where the highest timber volumes occur. Costly road building is eliminated in the

region of a goshawk nest. Minimal alternative silvicultural treatment is planned. The most timber volume would be removed for this alternative at the lowest cost.

Road Options

Because of the proposed location of the main haul road (8494) for all action alternatives near the 1994 Sandborn goshawk nest, two options to this location can be considered.

One option, known as Modification #1, would reroute the road and place it further from the location of the 1994 nest site. The modified route would require approximately 2,923 ft of additional road construction, and because of adverse grades, haul cost would be slightly greater. If this modified location were implemented, units 333087 (89) and 333088 (97) may be dropped to improve economics and/or to further minimize potential impacts to the goshawk nest.

Another option, which would only be applicable to Alternative C, is Modification #2, and known as the Road 6122 option. The 6122 road would be constructed as well as road 84940. The 8494 road would not be constructed from unit 333082 (71) to the junction of the roads between units 33301 (132) and 341102 (138).

Comparison of Alternatives by Identified Issue

The comparison of alternatives draws together the conclusions from the materials presented throughout this EIS, and provides the results of the analysis in a brief tabular summary. Table S-2 provides a comparison of alternatives by identified issue. The baseline for comparing the alternatives is Alternative A, the no-action alternative which also represents existing conditions. Chapter 2 contains a more detailed comparison of the alternatives, and Chapter 4 contains the detailed evaluation of the potential effects on the natural and social resources from timber harvest and road construction under each alternative.

Identification of Forest Service Preferred Alternative

The Forest Service has identified Alternative B as the Preferred Alternative. This alternative, as well as the other alternatives, will be evaluated before preparation of a Final EIS (FEIS), taking into consideration public comments as well as additional information and analysis. To be most useful, comments on this Preferred Alternative and the other alternatives in this DEIS should focus on particular aspects of the alternatives that the reviewer either likes or dislikes. The final selected alternative may be the same as the Preferred Alternative, a modified version of the Preferred Alternative, or an entirely different alternative.

Table S-1

Port Houghton/Cape Fanshaw Alternative Summary

Item	A	B	C	D	E
Total Net Scribner Volume (MMBF)	0	121.5	116.1	120.7	123.2
Total Area Harvested (Acres)	0	6,037*	5,618*	7,244*	5,471*
Number of Units	0	97	97	120	98
Average Acres/Unit	0	59	54	58	53
Silvicultural Methods (% by acres)					
Clearcut and w/reserves	0	59	68	52	93
Shelterwood w/reserves	0	26	32	21	7
Group selection	0	3	0	15	0
Sanitation salvage	0	12	0	10	0
Overstory removal	0	0	0	2	0
Logging System (% by acres)					
Helicopter	0	20	24	42	24
Running skyline	0	19	29	16	31
Slackline	0	25	33	18	33
Small slackline	0	26	12	17	10
Gravity return	0	8	2	6	1
Shovel	0	1	0	1	0
Highlead	0	less than 1%	less than 1%	less than 1%	less than 1%
Units Between 100-150 Acres	0	2	3	2	6
Number of Units Greater than 150 Acres	0	0	2	0	2
Road Construction (miles)					
Specified roads	0	74.7	94.1	69.4	79.5
Temporary roads	0	14.3	17.2	15.1	15.1

*Includes road right-of-way acreage.

Table S-2
Comparison of Environmental Consequences

Item	Alternative A	B	C	D	E
Timber					
Species Composition of Harvest Acres (%)					
Western hemlock	0	64	63	63	66
Sitka spruce	0	17	16	16	16
Alaska cedar	0	14	13	14	15
Mountain hemlock	0	5	8	7	3
Marine					
Marine habitat filled (acres)	0	up to 0.5	up to 1.1	up to 0.2	up to 0.2
Bark deposition/dispersion (acres)	0	up to 1	up to 1.2	up to 0.8	up to 0.8
Little Lagoon LTF (MMBF)	0	109	84	109	123
Rabbit Cove LTF (MMBF)	0	8.5	9	0	0
North Point LTF (MMBF)	0	0	10	0	0
Hobart Bay LTF (MMBF)	0	4	13	11	0
TES species effects	none	none	none	none	none
Wildlife Habitats (acres affected)					
Beach fringe	0	17	21	16	16
Scrub	0	3	2	3	<1
Forest Volume Class 3	0	4	4	4	4
Forest Volume Class 4	0	1,789	1,723	2,666	1,618
Forest Volume Class 5	0	2,123	2,036	2,178	2,017
Forest Volume Class 6	0	2,001	1,735	2,200	1,681
Forest Volume Class 7	0	31	3	26	69
Bogs, fens, and peatlands	0	55	69	90	45
Alpine	0	2	0	0	0
Wildlife Carrying Capacities (number of individuals)					
Vancouver Canada goose	276	265	275	264	265
Brown creeper	10,651	10,072	10,052	10,016	10,026
Bald eagle	263	263	263	263	261
Hairy woodpecker	2,236	2,059	2,087	2,042	2,074
River otter	97	97	97	97	97
Martin	371	353	356	350	354
Sitka black-tailed deer	2,467	2,313	2,359	2,309	2,352
Mountain goat	310	304	302	303	303
Red squirrel	106,273	102,283	102,221	101,986	102,216
Red-breasted sapsucker	14,867	14,058	14,031	13,979	13,994
Black bear	278	257	253	258	258
Gray wolf	9	9	9	9	9
Biodiversity					
Number of patches	220	585	597	557	592
Average patch size (acres)	223	80	80	84	80
Maximum patch size (acres)	12,400	5,984	3,912	6,237	6,237

Table S-2 (continued)
Comparison of Environmental Consequences

Item	Alternative A	B	C	D	E
Interior area of old-growth forest (acres)	20,408	15,357	15,188	15,386	15,416
% of old growth in patches > 100 acres	91	83	82	82	81
% of old growth in patches > 1,000 acres	75	66	60	60	64
TES Species					
Goshawk	no changes	known nests follow draft guidelines	known nests follow draft guidelines	known nests follow draft guidelines	known nests follow draft guidelines
Harlequin Duck (candidate)	no changes	potential sedimentation in foraging and loafing areas	potential sedimentation in foraging and loafing areas	potential sedimentation in foraging and loafing areas	potential sedimentation in foraging and loafing areas
Marbled Murrelet (candidate)	no changes	possible loss of nests in areas cut	possible loss of nests in areas cut	possible loss of nests in areas cut	possible loss of nests in areas cut
Fish/Water Quality					
Road construction miles in stream buffers	0	1.8	2.0	1.7	2.0
Number of road crossings over streams					
Class I/II	0	32	34	31	38
Class III	0	56	63	44	54
Total	0	88	97	75	92
Harvest unit acres within rain-on-snow elevation zone	0	4,660	4,670	4,620	4,630
Class III miles in harvest units and stream miles exposed to direct sun	0	12.2	13.6	12.4	11.9
Percent increases in sediment yield from roads over background conditions	0	18	19	15	27
Area in high potential erosion class soils (acres)	0	2,200	2,090	2,150	2,130
Geology/Minerals/Soils					
Effects on mining claims	none	increased access to Port Houghton stone producer	increased access to Port Houghton stone producer	none	none
Total acres of soil disturbance	none	6,386	6,030	7,553	5,841
% road miles ≥ 60% slopes	0	1	3	1	1
Unit acres on ≥ 70% slopes	0	66	82	73	73
Unit acres in wetlands	0	523	598	516	338
Road acres in wetlands	0	159	191	159	143
Floodplain crossing in acres	0	9	9	8	8
Unit acres in Soil Hazard Class III	0	1,770	1,587	1,699	1,915

Table S-2 (continued)

Comparison of Environmental Consequences

Item	Alternative A	B	C	D	E
Road acres in Soil Hazard Class III	0	96	119	92	115
Subsistence					
Significant Possibility of a Significant Restriction					
Salmon, finfish, shellfish	no	no	no	no	no
Deer	yes	yes	yes	yes	yes
Waterfowl	no	no	no	no	no
Harbor seals	no	no	no	no	no
Furbearers	no	no	no	no	no
Bear	no	no	no	no	no
Cultural Resources					
Overall risk to cultural resources	none	low	moderate	low	moderate
Sites potentially affected	none	none	one	one	one
Recreation—Acres of ROS Class (%)					
Primitive	66,047 (48)	23,565 (17)	20,270 (15)	20,258 (15)	24,115 (18)
Semi-primitive non-motorized	53,613 (39)	56,003 (41)	55,065 (40)	54,714 (40)	57,922 (42)
Semi-primitive motorized	17,163 (13)	22,249 (16)	25,189 (18)	21,184 (15)	17,810 (13)
Roaded modified	0 (0)	35,005 (26)	36,299 (27)	40,666 (30)	36,977 (27)
Visual Resources					
Visual effects by viewshed					
Farragut Bay	no change	no change	no change	no change	no change
North Arm	no change	harvest visible, natural appearance dominates, VQO: M, MM met*	harvest visible, disturbances resemble natural patterns, VQO: M, MM met*	harvest visible, natural appearance dominates, VQO: M, MM met*	harvest visible, disturbances resemble natural patterns, VQO: M, MM met*
Frederick Sound	no change	no change	no change	no change	no change
Whitney Island	no change	harvest visible, barely discernable, VQO: R, PR, M met*	harvest visible, barely discernable, VQO: R, PR, M met*	harvest visible, barely discernable, VQO: R, PR, M met*	harvest visible, barely discernable, VQO: R, PR, M met*
Mouth of Port Houghton	no change	harvest visible, no significant change from existing condition, VQO: PR, M met*	harvest visible, no significant change from existing condition, VQO: PR, M met*	harvest visible, no significant change from existing condition, VQO: PR, M met*	harvest visible, no significant change from existing condition, VQO: PR, M met*
Port Houghton	no change	harvest visible, disturbances resemble natural patterns, VQO: PR not met, M met*	harvest visible, disturbances resemble natural patterns, VQO: PR not met*	harvest visible, disturbances resemble natural patterns, VQO: PR not met, M met*	harvest visible, disturbances resemble natural patterns, VQO: M met*

Table S-2 (continued)

Comparison of Environmental Consequences

Item	Alternative A	B	C	D	E
Sandborn Canal	no change	no change	no change	no change	harvest visible, disturbances resemble natural patterns, VQO: M met*
Inner Port Houghton	no change	harvest strongly apparent; does not meet VQO of PR*	harvest strongly apparent; does not meet VQO of PR*	harvest visible, natural appearance dominates, VQO: M, met*	no change
Salt Chuck Antechamber	no change	no change	harvest strongly apparent, does not meet VQO of PR*	harvest visible, natural appearance dominates, VQO: M, PR met*	no change
Salt Chuck	no change	no change	no change	no change	no change
Economics					
Estimated current net stumpage value ($/MBF)	0	63.60	47.61	10.45	119.93
Number of jobs generated	0	1,045	999	1,038	1,059
Regional income generated ($ million)	0	29.0	27.7	28.8	29.4
Income contribution to GSP ($ million)	0	96.7	90.7	96.2	98.8

*VQO is visual quality objectives with PR = Partial Retention, M = Modification, MM = Maximum Modification, R = Retention.

Chapter 1

Purpose and Need

Chapter 1

Purpose and Need For Action

Project Overview

This draft environmental impact statement (DEIS) describes five alternatives for timber harvest, road and log transfer facility (LTF) construction, and related activities for a proposed timber harvest in the Port Houghton/Cape Fanshaw area on the mainland of Southeast Alaska. The no-action alternative would result in no timber harvest on National Forest land in the project area. In addition to describing the alternatives, this EIS documents the analyses of the expected environmental, economic, and social effects of each alternative.

Proposed Action

The Chatham and Stikine Areas of the Tongass National Forest propose to harvest approximately 123 million board feet (MMBF) of timber within the Port Houghton/Cape Fanshaw project area. The proposed harvest area is located on the mainland of Southeast Alaska about 80 miles south of Juneau. Associated with the proposed action would be construction of one LTF and 95 miles of road. The timber harvest planned for the project area could include one or several timber sales over a multi-year time period.

Purpose and Need

The purpose and need for the Port Houghton/Cape Fanshaw project is (1) to implement direction contained in the Tongass Land Management Plan (TLMP), as amended (U.S. Department of Agriculture, Forest Service [USDA-FS] 1979a, 1986), (2) to help provide a timber supply from the Tongass National Forest consistent with sound multiple use resource objectives and sustained yield management concepts, (3) to meet annual market demand for the timber industry in Southeast Alaska, and (4) to provide consistent local employment in the wood products industry throughout Southeast Alaska. The Port Houghton/Cape Fanshaw project is expected to provide between 100 and 125 MMBF of timber (net sawlog volume).

The TLMP schedules timber sale preparation for all management areas in the project area. A comparison of the desired future condition for the project area, as reflected in TLMP direction, with the existing condition shows the need to convert suitable stands of old growth timber to managed productive stands capable of long-term timber production.

Section 101 of the Tongass Timber Reform Act of 1990 (TTRA), directs the USDA-FS "...to the extent consistent with providing for the multiple use and sus-

tained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle." Section 101 of the TTRA specifies that Forest Service efforts to seek to meet market demand are subject to appropriation, National Forest Management Act (NFMA) requirements, and other applicable law. Providing a timber supply from the Tongass for sustained local wood products, industry employment, and related economic and social benefits is an objective of the TLMP, the Alaska National Interest Lands Conservation Act (ANILCA), as amended by the TTRA, and the Ketchikan Pulp Corporation (KPC) long-term contract.

Two indicators of market demands are used here in further defining the need. First, the price of bids for timber in the region remains high. Independent sales continue to sell for more than the appraised value. This reflects the nationwide and world price and demand for timber. Second, there is a demonstrated mill capacity in the region to process the logs, if the supply of timber is available. There is a projected need for the timber volume being considered from this project area for the Forest Service to come closer to meeting an objective of providing a three-year supply of timber under contract to the existing dependent industry, as a means of providing for stability in relation to fluctuating market demand (Morse 1995) There is a substantial component of the Southeast Alaska economy that is dependent on a viable timber industry. Based on these factors, the need for the project is clearly indicated.

Timber made available for harvest under this project may be sold as an independent timber sale or offered to KPC under its long-term sale contract. Any independent timber sales or KPC offerings implemented through this project will also help the Forest Service seek to meet market demand as indicated above. The KPC timber sale contract (USDA-FS 1951, Contract Number A10f-1042) includes the following provisions:

- <u>B0.61 Timber Offering Schedule</u>. Each year prior to February 15, Forest Service, after consultation with the purchaser, shall develop a tentative offering schedule based upon the Tongass National Forest Land and Resource Management Plan, which shall display offering areas and timber volumes proposed for harvest, and the expected NEPA process commencement and completion data for making any additional offerings under the terms of this contract. To the extent authorized by law, offering area(s) may be identified for harvest outside the sale area, as needed to meet sale volume requirements. The tentative schedule shall list sufficient timber volume and schedule commencement of the NEPA process by offering area(s) to provide purchaser a current timber supply sufficient for at least three years of operations hereunder or until the contract termination date, whichever occurs first, adjusting for the provisions of B0.63. In developing the schedule, Forest Service will consider the production requirements of purchaser's manufacturing facilities.

- B0.62 Specifying Offerings for Harvest. Based upon the tentative schedule and the NEPA process, and consistent with timber sale planning, management requirements, and environmental assessment procedures for independent Tongass National Forest timber sales, Forest Service after consultation with purchaser and completion of the NEPA process, shall specify any additional offerings. Forest Service shall seek to specify sufficient offerings to maintain a current timber supply in all offering areas that totals at least three years of operations hereunder or until the contract termination date, whichever occurs first, and which meets the projected requirements of purchaser's manufacturing facilities.

The maximum average rate per year at which KPC is generally allowed to harvest is 192.5 MMBF under long term contract section B0.52. KPC's average annual harvest rate, obtained from contract records, during the five-year period from March 1, 1989 through February 28, 1994 was 185.4 MMBF per year. Therefore, a three-year supply of timber for KPC's operations under the contract is currently estimated to range from 556.2 to 577.5 MMBF.

As of October 1, 1995, KPC had a current timber supply of approximately 145 MMBF. The maximum volume of timber that is anticipated to be provided to KPC in fiscal year 1996 is about 140 MMBF, 171 MMBF in fiscal year 1997, and 154 MMBG in fiscal year 1998. Assuming the maximum annual average harvest rate of 192.5 MMBG by KPC operations, a timber supply of only 82.5 MMBF would be available at the end of 1996, 61 MMBF at the end of 1997, and 23.5 MMBF at the end of 1998. These levels would fall well short of meeting the objective of specifying a three-year supply of timber volume for operations under the KPC contract, considering ongoing harvest at the projected rate noted above.

There have been suggestions that layout and other actions could be expedited to increase the amounts available from the contract area through 1997. However, the current assessment is that further expediting layout is not feasible, even with significant increased funding,while maintaining a reasonable assurance of quality work. The Forest Service has made efforts to accelerate the preparation of new offerings within the contract area. At present, about 852.7 MMBF in new timber projects are being prepared within the contract area, beyond what is reflected in the 1995-1997 figures presented above. However, because of the amount of time required to prepare new offerings in accordance with applicable laws, none of this volume is projected to be available until after fiscal year 1997. It remains to be seen how much of the volume in preparation will be cleared through the NEPA process and when it will be available.

Consequently, additional timber from outside the KPC contract area is needed in order to meet the three-year timber supply objective. Sale offerings currently scheduled, undergoing NEPA evaluation, or at some other stage in the preparation process are projected to be needed to help meet the KPC long-term contract and

independent sale project three-year supply objectives. If any currently planned independent sales were converted to KPC contract offerings, equivalent volume currently planned for KPC contract offerings would then likely need to be substituted as independent sale offerings in order to meet the projected need for independent timber volume. The first offerings from the Port Houghton/Cape Fanshaw project area could be available in 1998 to help meet either three-year supply objective.

Desired Future Condition

The desired future condition of the project area, as authorized in the TLMP (USDA-FS 1979a), as amended (USDA-FS 1986), is a mosaic of fast-growing second-growth timber that is interspersed with old-growth to balance economic timber needs and other resource or forest uses. Wildlife habitat and primitive recreational opportunities would be reduced from existing conditions through this direction; although large blocks of old-growth forest would remain for wildlife, and other recreational opportunities may increase as a result of road access.

Decision to be Made

The Chatham and Stikine Area Forest Supervisors will decide whether or not and where to make timber available in the Port Houghton/Cape Fanshaw project area to help meet market demands and Forest Plan goals for the Tongass National Forest. Based on the environmental analysis of consequences in this EIS, the following decisions will be documented in the Record of Decision:

- whether or not to harvest timber in the Port Houghton/Cape Fanshaw project area under this proposal,
- the amount of timber volume to make available for harvest,
- the location and design of timber harvest units,
- the location and design of associated mainline and local road corridors,
- the location of areas to be retained as old-growth habitat for the life of the project,
- mitigation measures associated with each alternative, and
- monitoring requirements.

Background

Project Area Location

The Port Houghton/Cape Fanshaw project area is located on the mainland of Southeast Alaska, 30 air miles northwest of Petersburg and 80 miles south of Juneau (Figure 1-1). Project area boundaries are from Cape Fanshaw south to the Farragut Bay North Arm, east to about Glory Lake, and north to an area between Port Houghton and Hobart Bay (see project area map).

Geographic Areas

For easy reference, the project area has been subdivided into four geographic areas: (1) **North Shore**, which includes the project area north of Port Houghton from the western shoreline to Rusty River; (2) **East Houghton** from east of Sandborn Canal and associated tributaries to Rusty River; (3) **North Fanshaw**, which includes the Chatham Area portion of the project area that is south of Port Houghton and west of Sandborn Canal; and (4) **South Fanshaw**, which is the Stikine portion of the project area.

The 2,919 acres of Alaska state-selected land located along the northwestern shoreline of Cape Fanshaw have not been developed or altered by the State. No plans for development in this area have been publicly disclosed, although plans for a marine park have been suggested for the state-selected land near Robert Islands.

Historical Studies in the Project Area

In the early 1980's a timber sale offering of 47 MMBF (including utility right-of-way) occurred in the Port Houghton project area. The offering was located primarily in the North Fanshaw portion of the project area, but included South Fanshaw directly north of Farragut Bay. An environmental assessment (EA) and Decision Notice were prepared in 1983 (USDA-FS 1983a) but no bids were received when the sale was offered. Consequently, the timber sale was withdrawn. No Forest Service timber sale activities have occurred in the project area since that time up until the planning for the proposed Port Houghton/Cape Fanshaw timber harvest.

Notice of Intent

On September 12, 1994, the Tongass National Forest published a Notice of Intent in the Federal Register (Vol. 59, No. 175, pp. 46819-46820), to prepare the EIS.

Public Scoping

Preliminary issue identification began in early 1994 through personal and agency contacts and background literature reviews. Public scoping was initiated informally during early 1994, but formally commenced with the mailing of a scoping newsletter in September 1994 to 755 interested individuals, agencies, industries, and environmental organizations. Public notices were placed in local newspapers (Juneau Empire, Wrangell Sentinel, and Petersburg Pilot) requesting public comment and inviting interested citizens, agencies, businesses, and organizations to public scoping meetings held in Hobart Bay, Wrangell, Petersburg, Kake, and Juneau. In addition, an open house was held in Juneau in late October 1994.

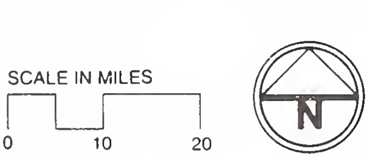
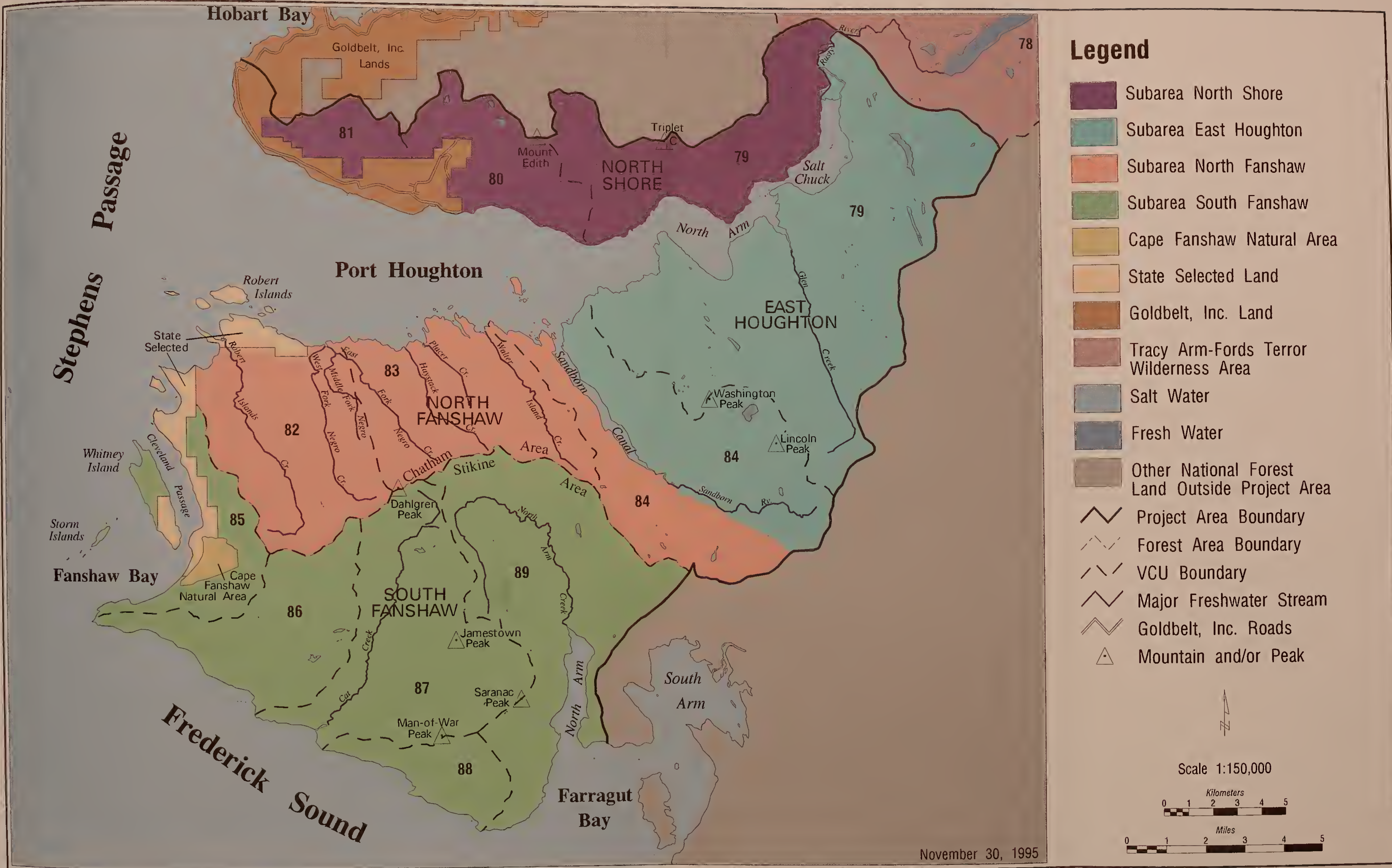


Figure 1-1.
Location of the Port Houghton/ Cape Fanshaw Project Area on the Mainland of Southeastern Alaska

Project Area with Land Status, VCUs, and Subareas



The proposed action discussed in the scoping brochure during fall 1994 was obtained from the original unit and road pool developed prior to field analysis. This information was presented to the public to solicit more focused comments than would have been obtained if no units, roads, or alternatives were presented. The public meeting was held following field studies to share with the public the data collected during these studies.

A second newsletter, sent in March, 1995, to individuals on the mailing list, described the comments received from the public to date. Issues were developed based on the comments received.

Field Studies

Field studies refined the unit and road pool needed to develop action alternatives. Resource information contained in the Tongass National Forest geographic information system (GIS) was verified and updated. Resource specialists who surveyed the project area included logging engineers, transportation planners, foresters, silviculturists, fisheries, marine, and wildlife biologists, recreation specialists, landscape architects, archaeologists, botanists, hydrologists, and soils scientists.

Field studies used unit and road cards to document the location of units, roads, and potential LTF sites. Resource specialists listed specific concerns on the cards, and recommended how those concerns should be addressed or mitigated (Appendix A and B). In many situations, units and roads were relocated or dropped from further analysis in response to these concerns.

Action Alternatives

Action alternatives were then developed based on issues discussed during the public comment period and the updated field data. The final action alternatives are unique from the initial proposed action because some units that were components of the proposed action presented during public scoping were deleted or altered during field inventories.

Information from the field studies was then used to address the issues and analyze the environmental effects of each alternative. The entire analysis was used to select a preferred alternative. This document, the DEIS, is being distributed for public review and comment. The Forest Service will then respond to comments on the DEIS and integrate any changes into the FEIS.

How This Project Relates to the Forest Plan

The Port Houghton/Cape Fanshaw proposed timber harvest would implement portions of the management direction adopted in the current TLMP, as amended. Implementation of any action alternatives would also be consistent with the recent

Supplement to the Draft EIS for the TLMP Revision (USDA-FS 1991). This document also tiers to the EIS for the Alaska Regional Guide (USDA-FS 1983b).

Land Use Designations

The project area is comprised of 11 value comparison units (VCUs) with VCUs 79 to 84 within the Chatham Area and VCUs 85 to 89 within the Stikine Area. The Chatham Area comprises State of Alaska wildlife analysis area (WAA) 2927, but also included within this WAA are VCUs 78 and 88—a wilderness area (Tracy Arms-Fords Terror Wilderness) adjacent and northeast of the project area. The Stikine Area of the project area represents WAA 1601.

The TLMP (1979, as amended 1986) designates areas appropriate for various activities through four LUD allocations. VCU 79 has been designated LUD III. All other VCUs in the project area (total of 10) are designated LUD IV.

A LUD designation of III indicates that the lands are to be managed for a variety of uses and activities to provide the greatest combination of benefits. These areas have either high use or high amenity values in conjunction with high commodity values. Allowances in calculated potential timber yield have been made to meet multiple objectives. These lands may include concentrated recreational developments.

A designation of IV indicates that opportunities are to be provided for intensive resource use and development where emphasis is primarily on commodity or market resources. Allowances in calculated potential timber yield have been made to provide for protection of physical and biological productivity.

Selection of the Port Houghton/Cape Fanshaw Project Area

The Port Houghton/Cape Fanshaw project area was selected for environmental analysis at this time as part of the implementation process of the Tongass Land Management Plan (1979, as amended).

The Tongass Land Management Plan (1979) allocated lands within the Port Houghton/Cape Fanshaw Project Area as LUD III and LUD IV as well as scheduled timber sale activities in both Management Areas C14 and S01. The Port Houghton Timber Sale Project was then added to both the Chatham and Stikine Areas' Ten Year Timber Sale Plans; an environmental document developed for the project; the timber sale package prepared; and the sale offered to industry in 1983. The sale was not sold due to low market conditions during the time of offer and the sale was placed on the shelf as fully prepared volume. The Forest Service intended to reoffer the sale when market conditions improved due to the significant investments made in the development of the timber sale project. These investments included resource inventories, road locations and design, timber harvest unit location and design, and log transfer locations and permits with the State of Alaska and Corps of Engineers.

The Tongass Land Management Plan (1979) was amended during the winter of 1985/1986 for the purpose of bringing the Plan in line with several changes that

had occurred since its passage (ANILCA, reestablishment of ranger districts, etc.). The 1983 Port Houghton timber sale was not effected by the update of TLMP due to the project area still being identified as LUD III and IV, the project still being scheduled for implementation, and the sale still being active as shelf volume pending reoffer. However, market conditions immediately after the update of TLMP remained relatively the same and the sale remained unsold.

In 1990, the Tongass Timber Reform Act legislated certain lands on the Tongass National Forest as wilderness and Land Use Designation (LUD) II. The Port Houghton/Cape Fanshaw area was not affected by these designations and remained in the same allocations as before the Act was passed. TTRA did, however mandate buffers on all Class I and Class II streams flowing directly into Class I streams which needed to be incorporated into the Port Houghton timber sale (1983).

In January 1993, the Stikine and Chatham Area Forest Supervisors made an administrative decision to again look at the Port Houghton/Cape Fanshaw area for a timber sale project for the purposes of recapturing prior investments in the immediate vicinity, provide an orderly flow of timber from National Forest lands to a dependent industry, and for implementation of the Tongass Land Management Plan (1979, as amended). This decision dropped in priority the consideration of alternative project areas that had limited or no field work completed. The sale was again added to the Chatham and Stikine Areas' Ten Year Timber Sale Plan as Port Houghton/Cape Fanshaw. Based on the age of the environmental analysis clearing the Port Houghton timber sale (1983), the Forest Service also decided to reanalyze an expanded project area taking into consideration the passage of the Tongass Timber Reform Act (TTRA) in 1990, a need for an extensive cumulative effects analysis, and work that was underway in the revision of the Tongass Land Management Plan (1979, as amended).

Analysis resulting from the revision of the Tongass Land Management Plan, substantiated the fact that the volume available for harvest within the expanded project area was sufficient to meet timber offer objectives from the Tongass National Forest. Information derived from the TLMP revision process indicated harvest of the amount of timber being considered for this project could occur consistent with the TLMP (1979, as amended) standards and guidelines as well as the TLMP Revision Supplemental Draft Environmental Impact Statement standard and guidelines.

The volume anticipated to be made available from the Port Houghton/Cape Fanshaw Area is not excess to the supply needs of the existing timber industry in Southeast Alaska. This fact is demonstrated by a market assessment completed for the independent sale program (Morse 1995) and discussions with the Ketchikan Area in regards to their timber sale offerings for the Ketchikan Pulp Company long-term timber sale contract. Without the timber volume anticipated to be

cleared through this analysis, there is potential for not achieving an orderly flow of timber from national forest lands to a dependent industry.

Issues

The issues described below were developed from concerns raised by resource specialists, other Forest Service staff, and the public during the scoping process. These issues were used to direct the formulation and evaluation of the alternatives. While many other issues exist, the issues described below were deemed significant for detailed analysis as directed by the NEPA. For the purpose of alternative development, the issues have been grouped into two broad categories: resource issues, and social and economic issues. For each resource, the issue is summarized, followed by approaches that can be used to measure differences among alternatives in this EIS.

The following issues focus on natural resources in the project area that may be affected by implementation of the alternatives. Quantitative measurements can be applied to most of the issues in this group.

(1) Timber

What changes may be anticipated in the character of the timber resource?

This issue is evaluated by the change in volume class and plant association as a result of the amount, size, dispersion of harvest, and harvest method for each alternative.

(2) Alternative Silviculture

To what extent are alternative silvicultural treatments proposed in the project area, and what are the benefits?

Soils, wildlife, silvicultural, fisheries, and visual concerns with clearcutting resulted in the development of various alternative silvicultural treatments for some units. Differences in the proposed alternatives are compared by: the type and amount of various alternative silviculture proposed, logging system, silvicultural method, vegetative type, volume, landscape design, regeneration plans, and the cost of these treatment systems along with expected results.

(3) Marine Resources

What will be the effect of LTF development on marine resource values?

The amount of harvest and the method of access will determine the use and development of LTF sites. This issue will be assessed by comparing alternatives for the number of LTF sites to be developed, LTF location and acreages affected, expected volume of timber to be delivered to each LTF, LTF compliance with Alaska Timber Task Force (ATTF) guidelines (developed to minimize impacts to marine resources), type of facility, and area of marine habitat affected.

(4) Wildlife

What change in wildlife habitat capability would occur with implementation of the project?

This is measured by the changes in habitat quality and/or wildlife carrying capacity for each management indicator species (MIS), as well as to other species of importance to the public.

(5) Biodiversity

What changes will occur in habitat and plant and animal diversity within the project area?

Measurements are made by assessing changes to the amount, location and connectivity of old-growth habitats among alternatives; the amount of new edge created; and alterations of habitat diversity and structure. Expected changes in animal numbers and species is described.

(6) Fish Habitat

What will be the effect of the timber harvest and transportation system development on the fish habitat within the project area?

Effects to fisheries resources are measured by: the number of road crossings of Class I and II streams; acres within rain-on-snow elevation zone; Class III miles in harvest units and stream miles exposed to direct sun; percent increases in sediment yield from roads over background conditions; and acres harvested in high potential erosion (Class III) soils.

(7) Physical Resources

What effect will timber harvest have on soil stability?

All action alternatives were developed to minimize soil impacts to the fullest extent possible by either avoiding areas of high soil hazard or developing mitigation measures that minimize impacts. However, quantitative differences among alternatives can be assessed for soils based on the acres of soil disturbance by soil hazard class (each class designating a different degree of soil hazard) and the amount of timber harvest on steep slopes.

The following issues focus social and economic values in the project area. These values are best measured in qualitative or dollar terms.

(8) Subsistence

How will timber harvest affect fishing, hunting and gathering opportunities within the project area?

Increased access, human presence, and modifications as a result of development within the project area would both attract and discourage different users. The resource trade-offs in the initial development of an undisturbed area are described for hunters, gatherers, and fishers who have historically used the project area. The effects for new users, who would now be attracted to a more accessible area, are described to the degree possible.

(9) Cultural Resources

How will both known and unknown cultural resources be protected?

All known cultural resources would be avoided. However, some differences among alternatives remain for cultural resources. The assessment focuses on the distance of harvest disturbance from known cultural resources, and the amount of harvest disturbance in areas of high probability for unknown cultural resources.

(10, 11) Recreation and Visual

What visual and recreational changes will affect both local and tourist use and enjoyment of the project area?

Effects are assessed by changes in the recreation opportunity spectrum (ROS), identification of resources important to recreationists, amount of harvest area seen (changes to VQO), changes in anchorage sites, and amount of harvest near existing and proposed recreational sites. ROS and VQO are defined in the Glossary.

(12) Economics

What are the basic economic values that can be expected with the project?

Income and employment impacts to the economy and the relative economic efficiency of the alternatives is used to assess the alternatives. Estimated costs and returns to the government are compared among alternatives to address this aspect of the economic issue.

Issues Not Addressed in the EIS in Detail

Some issues raised by the public are not project-specific or are the subject of pending decisions at a higher level of planning. Examples of issues or comments beyond the scope of this document follow:

<u>Wild and Scenic Rivers</u>: Will the proposed timber harvest affect consideration of the Houghton River (Salt Chuck) or Sandborn River as a Wild and Scenic River?

Both the categorization and recommendation for Wild and Scenic River status are evaluated at the overall Forest Planning level for the entire National Forest—not at the project level such as this. There are no rivers either currently having this designation or being recommended for this designation in the project area. However, alternatives being considered for this EIS would allow future designation of Wild and Scenic for either the Houghton or Sandborn River.

<u>Habitat Conservation Areas (HCAs)</u>: Will the HCAs initially recommended by the Viable Population Committee be implemented with the proposed harvest (HCAs are described more fully in the Glossary)?

An Interagency Viable Population Committee developed criteria for defining and establishing HCAs as a means of maintaining distributed wildlife populations within the Tongass National Forest.

Section 502(A) of the 1995 Recission Bill (PL 104-19, signed July 27, 1995) directs that no funds are to be used to implement HCAs for species that have not been declared threatened or endangered, except that there may be Goshawk HCA's not to exceed 300 acres per active nest.

Field Studies: There were several requests that additional field work be conducted throughout the year to obtain more information on the resources present in the project area.

Though more information is always desirable, these requests were considered and it was determined that additional data was not necessary in making a reasoned choice among alternatives. Additional cultural resource studies were conducted during summer 1995 concerning an intertidal prehistoric site.

Goldbelt, Inc. Land Exchange: A land exchange has recently been proposed by Goldbelt, Inc. in the Port Houghton project area. The proposal from Goldbelt, Inc. is preliminary at this time, no agreement has been reached as to what lands are specifically involved, nor has a formal land exchange process been started. The first step will be to develop an Agreement to Initiate. That document is a non-binding agreement that states what lands will be analyzed for exchange. Discussions have occurred with Goldbelt, Inc. that could lead to the preparation of such an agreement. Since there is no Agreement to Initiate that would describe lands to be negotiated in an exchange, an analysis of such a proposal in the Port Houghton/Cape Fanshaw EIS is not possible at this time. Once the Agreement to Initiate is finalized, maps will be available that show the lands involved and the appropriate analysis can be done.

Permits and Licenses

To proceed with the timber harvest as addressed in this EIS, various permits must be obtained from other agencies. Administrative actions on these permits would take place after the FEIS is filed with the U.S. Environmental Protection Agency (EPA). Both EPA and the Corps of Engineers are cooperating agencies. The permitting agencies and their responsibilities are listed below.

U.S. Army Corps of Engineers (COE)

- Authorizes dredge or fill activities in the waters of the United States (Section 404 of the Clean Water Act).

- Authorizes structures that may impede navigation in navigable waters of the United States (Section 10 of the Rivers and Harbors Act of 1899).

U.S. Environmental Protection Agency (EPA)

- Authorizes point source discharge based on a National Pollutant Discharge Elimination System (NPDES) review (Section 402 of the Clean Water Act).

State of Alaska, Department of Natural Resources (ADNR)

- Authorizes occupancy and use of tidelands and submerged lands.

State of Alaska, Department of Environmental Conservation (ADEC)

- Authorizes disposal with a Solid Waste Disposal Permit.

- Issues a Certificate of Reasonable Assurance which is incorporated into the COE permit. This certifies that there is a reasonable assurance that the proposed activity will meet or exceed State water quality standards (Section 401 of the Clean Water Act).

State of Alaska, Division of Governmental Coordination (ADGC)

- A review coordinated by ADGC determines whether the State agencies agree with Forest Service determination of consistency with the Alaska Coastal Zone Management Plan.

U.S. Coast Guard

- A Coast Guard Bridge Permit (in accordance with the General Bridge Act of 1946) is required for all structures constructed across navigable waters of the U.S.

U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS)

- These agencies determine compliance with the Endangered Species Act.

Legislation and Executive Orders Related to This EIS

Shown below is a brief list of laws pertaining to preparation of EISs on federal lands. Some of these laws are specific to Alaska, while others apply to all federal lands.

- Alaska Native Allotment Act of 1906
- National Historic Preservation Act of 1966
- National Environmental Policy Act (NEPA) of 1969 (as amended)
- Clean Air Act of 1970 (as amended)
- Alaska Native Claims Settlement Act (ANCSA) of 1971
- Marine Mammal Protection Act of 1972
- Endangered Species Act of 1973
- Forest and Rangeland Renewable Resources Planning Act of 1974
- National Forest Management Act (NFMA) of 1976 (as amended)
- Clean Water Act of 1977
- Alaska National Interest Lands Conservation Act (ANILCA) of 1980
- Federal Cave Resource Protection Act of 1988
- Tongass Timber Reform Act (TTRA) of 1990
- Native American Graves Protection and Repatriation Act of 1990
- Coastal Zone Management Act (CZMA) of 1976 (as amended)
- Recission Bill of 1995 (PL 104-19, signed July 27, 1995)

Availability of the Planning Record

An important consideration in the preparation of this EIS has been reduction of paperwork as specified in 40 CFR 1500.4. In general, the objective is to furnish enough site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and how these impacts can be mitigated.

More detailed reports and references are available upon request at the Forest Supervisors' offices in Petersburg and Sitka, Alaska. Other reference documents such as the TLMP, as amended, the Revision DEIS (USDA-FS 1991), the TTRA, the Resources Planning Act, and the Alaska Regional Guide EIS are available at public libraries around the region, as well as at the Supervisors' offices.

Chapter 2

Alternatives

Chapter 2

Alternatives Including the Proposed Action

This chapter summarizes the development of alternatives for timber harvest in the Port Houghton/Cape Fanshaw project area. The five alternatives considered for the project area are discussed and compared in this chapter, as well as presented in more detail in Chapter 4. After this comparison, the Forest Service preferred alternative is presented. Specifically, this chapter presents the following information:

- alternative formulation process,
- alternative development for the Port Houghton/Cape Fanshaw project area,
- alternatives considered but eliminated from detailed study,
- alternatives considered in detail,
- actions common to all alternatives,
- a summary comparison of alternatives, and
- identification of the preferred alternative.

Development of Alternatives

Each alternative presented in this EIS represents a different response to the issues discussed in Chapter 1. Four action alternatives were developed that meet the stated purpose and need of the project. Each action alternative consists of a site-specific proposal developed through intensive interdisciplinary discussion and evaluation. The locations of units and roads are based on ground verification of all units and roads considered, along with aerial photo, topographic map, and GIS review.

A detailed Logging System and Transportation Analysis (LSTA) specific to the Port Houghton/Cape Fanshaw project area was developed by the project logging and transportation engineers. This LSTA was consistent with the TLMP, including the Revision Supplement to the Draft EIS, as well as the TTRA and existing Memorandums of Agreement between the Forest Service and other state and federal agencies. The LSTA was based primarily on aerial photo

interpretation and topographic maps. The LSTA was initially drawn on aerial photographs and then transferred onto the GIS system.

The units and roads in the LSTA became the areas where field verification occurred. Each unit and road depicted in an alternative was ground-verified by a team of specialists during the summer of 1994. Most field effort encompassed: (1) flagging of roads, landings, and unit boundaries, (2) conducting timber resource inventories and preparing silvicultural prescriptions, (2) flagging Class I and II streams adjacent to units and crossed by roads, (3) flagging Class III streams near units and roads where other resource specialists may encounter these streams and question whether the streams were reviewed by a fisheries biologist, (4) flagging of V-notches within units and problem areas where mitigation is necessary to avoid impacts, and (5) field review of all sensitive soils within the vicinity of units and roads to verify the accuracy of soils classification, and to move units and roads out of very high hazard soils.

Other field inventories performed by resource specialists determined existing conditions for their respective discipline. These activities included: (1) a search for caves and other karst features in the project area; (2) fish and water quality measurements in the vicinity of units and roads; (3) wildlife surveys for threatened, endangered, and sensitive species (TES); MIS; and other uncommon and common species; (4) marine surveys in the vicinity of LTF sites and within Port Houghton; (5) searches for TES plants; (6) a review of the recreational opportunities and use in the project area; (7) cultural resource investigations of all high-probability areas; and (8) determining visual sensitivity of units and roads in the project area and photographing viewpoints selected for analysis.

Using ground verification data and interdisciplinary team (ID Team) recommendations, units and roads were modified, deleted, or added to the unit and road pool. Unit and road cards were completed by the resource specialists. Units that could not be mitigated adequately were deleted. Other units identified during field review were added. The resulting unit pool consisted of 186 units.

The revised unit and road pool data were entered into the GIS database from early August through November 1994. Following formal scoping held in September to November 1994 (described in Chapter 1), the ID Team reviewed and analyzed the issues developed during scoping and identified the significant issues described in Chapter 1. Options for responding to each issue were discussed. Issues identified as significant were categorized according to whether they could help: (1) in developing either all action alternatives or one specific action alternative, (2) as a project-specific mitigation measure, (3) through implementation of standards and guidelines and best management practices (BMPs) defined by the Forest Plan, or (4) on a unit-specific basis for one or more alternatives. In addition, some issues were categorized as being beyond the scope of the EIS.

Themes were developed for alternatives that minimize or avoid impacts in specific resource areas. Units and roads were then selected from the field-inventoried unit and road pool to best complement that theme.

Each action alternative considered for detailed study meets the stated purpose and need of the project, which is to make from 110 to 125 MMBF (net sawlog volume) of timber available from the Port Houghton/Cape Fanshaw project area in a manner consistent with the Forest Plan management direction/emphasis and the desired future condition for the project area.

The alternatives are designed to comply with Forest Service planning documents (such as the Alaska Regional Guide, the TLMP as amended, and the intent of the TLMP Draft Revisions [1991]).

Each alternative also complies with Sec. 103(e) of TTRA, which states that the Forest Service shall:

> . . . maintain a buffer zone of no less than 100 ft. in width on each side of all Class I steams in the Tongass National Forest, and on those Class II streams which flow directly into Class I streams, within which commercial timber harvesting shall be prohibited . . .

In addition, each alternative avoids timber harvest in the 500 ft. shoreline buffer of beach fringe or the 1,000 ft. estuary buffer, except for LTFs and associated roads.

Ecosystem management opportunities that were incorporated into alternatives were considered both at the landscape level (e.g., project area, VCU, watershed or viewshed) and at the stand level (e.g., individual harvest unit). Some of these incorporated opportunities include:

Landscape level

- maintaining large, unfragmented blocks of old-growth forest,
- minimizing the amount of edge by designing larger harvest units, and
- using beach and estuary fringe and stream buffers as corridors between old-growth blocks.

Stand level

- retaining snags in harvest units (where safety regulations allow),

- retaining individual live reserve trees or small patches of live reserve trees in clearcuts,
- using selective harvest systems to maintain visual quality and wildlife habitat for some species,
- using shelterwood harvest systems to maintain visual quality and wildlife habitat, and
- maintaining down woody material in harvest units.

Considerations in the Development of Alternatives

Adaptive Management

The adaptive management concept was integrated into action alternatives and unit design for the proposed timber sale. It is a sequence of planning, acting, monitoring, evaluating, and adjusting future management actions based on information gained from the initial action. For the Port Houghton/Cape Fanshaw project, the actions are developed primarily from the implementation and monitoring of silvicultural prescriptions. These prescriptions were prepared based on interdisciplinary concerns and the most recent research conducted in the fields of soils science, forest regeneration, vegetation composition and control, wildlife habitats, and visual concerns. Some examples include combining silvicultural systems within units, combining logging systems within units, implementing salvage and group selection (as described below), developing approaches to take advantage of windthrow, and observing aesthetic differences among the varying silvicultural methods. The specific adaptive management approaches developed for the project area are described in detail in Appendices E and L which additionally include the monitoring and mitigation plans, respectively.

Salvage Areas

During field investigations, a 679-acre area divided into three subareas (261,271,291) within the South Fanshaw portion of the project area was observed to have a substantial number of Alaska yellow cedar trees that are dead or dying. Many of the stands in this area have Alaska yellow cedar components that range from 20 to 50 percent of the basal area. This area is recommended to be managed through selective helicopter harvesting of individual cedar trees. The intent is to remove salvageable dead or dying trees, and leave trees that are healthy. Because of its high value, selective logging of Alaska yellow cedar can result in an economic benefit, while conserving Alaska yellow cedar growing stock and seed sources for natural regeneration.

Treatment areas for salvage were selected based on an existing contiguous forest cover that is at least 200 acres in size, the presence of Alaska yellow cedar decline, and the feasibility of helicopter logging. Treatment areas are a minimum distance of 100 ft. from Class I and II streams, and avoid Very High Hazard soils,

non-timbered low-productivity areas, high-volume areas (Class 6 and above) of cedar, and areas of windthrow risk.

The planned entry cycle for the salvage area is every 20 to 25 years. Alaska yellow cedar snags that are to be cut should be 24 to 30 inches diameter-at-breast height (dbh), and have tree characteristics that are undesirable as seed trees (such as a perched rooting system, suppressed crown class, dead and diseased trees). Trees to leave in place are those with crown ratios of 35 percent or greater, no pathogen indicators, rooting systems that are not perched, minimal defects, and well-formed tops. Timber harvest volume is expected to range from 2 to 12 thousand board feet (MBF) per acre depending on specific stand conditions.

Group Selection Areas

Group selection is an uneven-aged timber management approach that would result in the harvest of the groups that are 2 acres in size or less. A group is considered similar to a forest gap; it is less than stand size but larger than the area occupied by a single tree. The proposed project recommends group selection on both a forest basis (large-scale) and unit (small-scale) basis. On a forest basis, five larger areas (subdivided into one to several stands) have been identified: 321 (164 acres), 322 (186 acres), 331 (45 acres), and 332 (151 acres), and 398 (151 acres).

Within each stand designated for group selection, selective cuts of up to 2-acres are recommended, and the stands would be helicopter harvested. All groups would be a minimum distance of 100 ft. from Class I and II streams, and would avoid Very High Hazard soils, non-timbered low-productivity areas, high-volume areas (Class 6 and above), and areas of windthrow risk. About 25 percent of these stands would be harvested every 30 years.

Because of the difficulty of tracking and controlling planting and other silvicultural operations on 2-acre (or less) units, natural regeneration would be used with this method. Most groups would likely regenerate to hemlock. Where possible, spruce and cedar would be left on group edges as a seed source.

The group selection harvest method is also recommended for six specific harvest units that are described in detail in the timber section of Chapter 4. Group selection harvest within units would include helicopter, cable, and ground-based logging methods.

Alternatives Considered But Eliminated From Detailed Study

As each alternative theme was developed, it was determined that some public issues could not be met and still meet the purpose and need of the project. The following alternatives were initially considered but dropped from further

evaluation primarily because the volume identified by the purpose and need could not be met.

Visual Quality

An alternative was initially considered that would result in no units and roads being seen in the project area from the water. This was attempted but was determined not possible based on a minimum timber harvest requirement of 110 MMBF.

Northern Goshawk

The ID Team considered modifying the unit and road pool to avoid harvest in a 2,000-acre radius around each discovered nest. This was not possible due to road connections and logging feasibility. In addition, standards and guidelines for management of goshawk nests in the Tongass National Forest have not been finalized. An attempt to develop an action alternative(s) that exceeded interim guidelines was determined to not be cost effective. The intent for this project is that, once goshawk guidelines become finalized, any action alternative selected for implementation would be modified as necessary to comply with these guidelines. Section 502(A) of the 1995 Recission Bill (P.L. 104-19, S16NRO July 27, 1995) directs that no funds are to be used to implement HCAs for species that have been threatened or endangered except that there may be goshawk HCAs not to exceed 300 acres per active nest.

Habitat Conservation Areas

Several public comments requested avoidance of initially recommended habitat conservation areas (HCAs) for all action alternatives. The unit and road configuration for Alternative B does not conflict with areas initially recommended as HCAs.

Alternatives Considered in Detail

Alternative A (No-Action Alternative)

A no-action alternative is analyzed in this EIS, and is a requirement of NEPA. This alternative provides a benchmark for comparison of the action alternatives.

No harvest activities on National Forest lands are planned in the project area for this alternative. Logging is expected to occur on the Goldbelt, Inc. lands in the project area at least until 1997 when harvest on all present land holdings is expected to be completed. Alternative A does not meet the purpose and need of the project as described in Chapter 1. For the most part, conditions that currently exist in the project area represent the no-action alternative which is shown in the project area map.

Alternative B

The primary intent of Alternative B is to minimize shoreline disturbance that could occur to fishing opportunities, subsistence use, visual conditions, cultural resources (both known and undiscovered), and existing recreational opportunities through avoiding most timber harvest within one mile of shoreline areas in North Fanshaw between Sandborn Canal and Robert Islands (see Alternative B map). Harvest does occur within one mile of the shoreline at East Houghton east of Sandborn Canal and at North Shore near Goldbelt, Inc. lands. Some units further than one mile from the shoreline are also avoided to decrease the amount of harvest area seen. No timber harvest is planned in the Sandborn Canal tributaries.

Ninety-seven units are planned for harvest in Alternative B. The majority of the timber harvest and road construction for Alternative B would occur in the North Fanshaw portion of the project area, followed by South Fanshaw. In addition, five units are planned for harvest at North Shore and six units are planned for harvest in East Houghton. Total timber volume is 121.5 MMBF with 6,037 acres being harvested which includes timber logged in the road right-of-way.

This alternative has four proposed silvicultural methods with 59 percent of the unit volume being harvested as either clearcut or clearcut with reserves. About 26 percent would be cut as shelterwood with reserves and 12 percent as overstory removal. Sanitation salvage is planned in 3 percent of the project area which would occur in the South Fanshaw area. No larger group selection areas are planned for this alternative.

The majority of the units (80 percent) would be harvested using conventional logging systems. In addition to the salvage areas, nine units are proposed to be harvested using helicopters. Two units would be harvested that are greater than 100 acres.

Two new LTFs (Little Lagoon and Rabbit Cove) are planned for Alternative B with 89 percent of the timber volume being transported through the Little Lagoon LTF (Table 2-1). The Rabbit Cove LTF would be used for 8 percent of the timber volume and the existing Hobart Bay LTF would be used for 3 percent of the timber volume.

Alternative B Summary			
Net Scribner MBF:	121,523	Total Road Miles:	89
Total Acres Harvested:	6,037	Specified Road Miles:	74.7
Number of Units:	97	New LTFs: Little Lagoon, Rabbit Cove	
Average Acres/Unit:	59	Existing LTFs: Hobart Bay	
Average Net MBF/Unit:	1,253		
Average Net MBF/Acre:	21		

Table 2-1

Timber Volume (MMBF) to be Transported at each LTF and Estimated LTF Life Span

LTF Site	Alternative B	C	D	E	Estimated Life span of LTF
Little Lagoon	109	84	109	123	This timber harvest; available for future timber sales
North Point	0	10	0	0	This timber harvest only
Rabbit Cove	9	9	0	0	This timber harvest only
Hobart Bay[1]	4	13	11	0	N/A
Total	122	116	120	123	

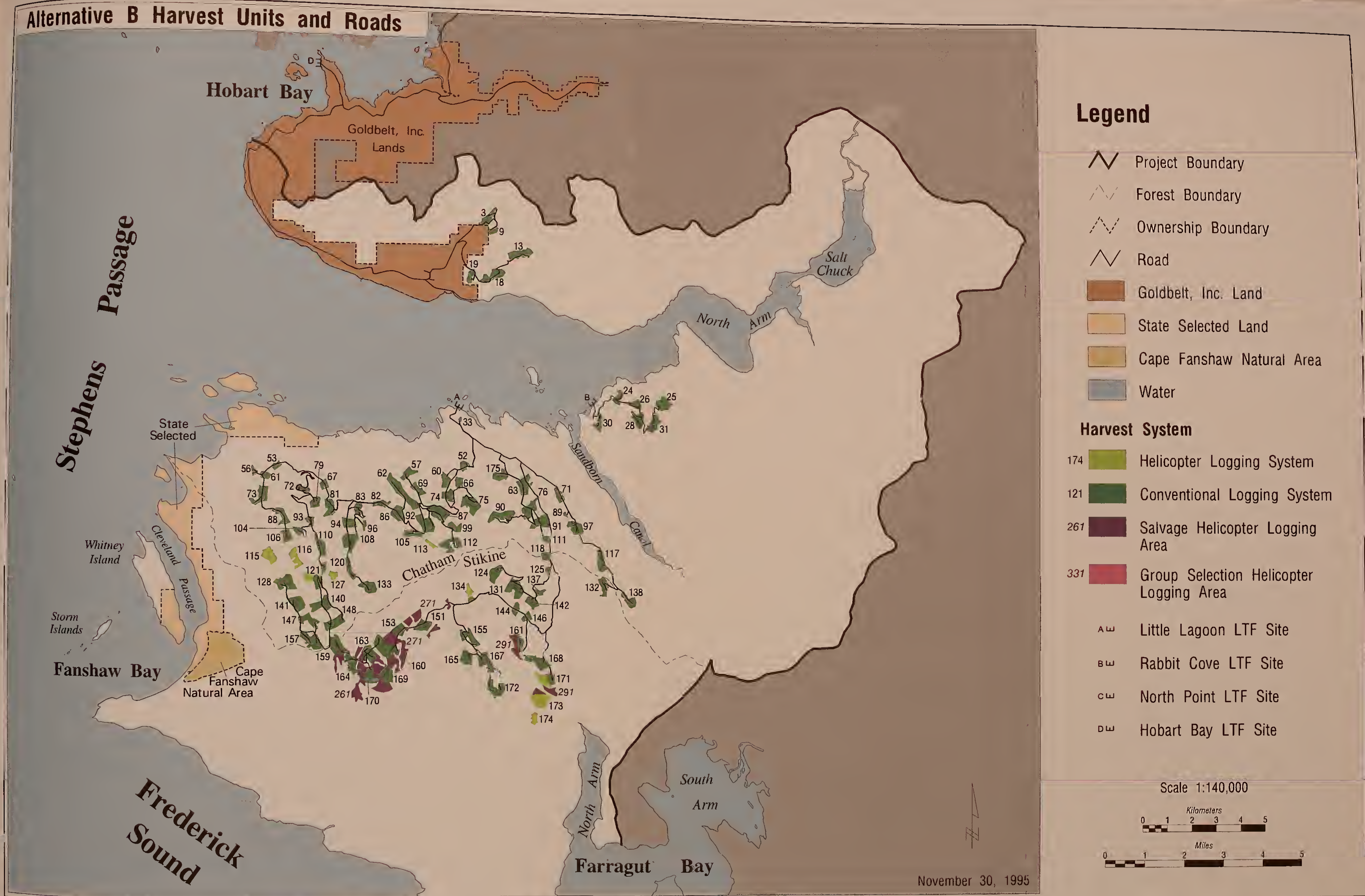
[1]Existing LTF site on private land outside of the project area.
Source: McKenzie 1995a

About 89 miles of road would be constructed to harvest and transport timber to the LTFs (Table 2-2). Specified road construction would be utilized on 84 percent (75 miles) with the remaining 16 percent (14 miles) being temporary construction. (See Glossary for definitions of specified and temporary roads).

Alternative C

This alternative avoids the placement of harvest units near areas identified as supporting important salmonid fisheries (see Alternative C map). These areas include Sandborn Canal, the headwaters of Negro Creek, and most Class I and II streams near shoreline areas between Negro Creek and Sandborn Canal. Timber harvest between Jamestown and Dahlgren peaks is decreased compared to the other action alternatives, and road construction is minimized in this area to avoid disturbance to mountain goat travel between the two peaks.

Similar to Alternative B, ninety-seven units are also planned for harvest in Alternative C. The majority of the timber harvest and road construction for Alternative C would occur in the North Fanshaw portion of the project area, followed by South Fanshaw. In addition, 12 units are planned for harvest at North Shore and 12 units are planned for harvest in East Houghton. In comparison to the other action alternatives, harvest is spread out over a greater



Alternative B Harvest Units and Roads
Hobart Bay
Goldbelt, Inc. Lands
Stephens Passage
North Arm
Salt Chuck
Sandborn Canal
State Selected
Whitney Island
Cleveland Passage
Storm Islands
Fanshaw Bay
Cape Fanshaw Natural Area
Chatham Stikine
Frederick Sound
North Arm
South Arm
Farragut Bay
November 30, 1995
Legend
Project Boundary
Forest Boundary
Ownership Boundary
Road
Goldbelt, Inc. Land
State Selected Land
Cape Fanshaw Natural Area
Water
Harvest System
174 Helicopter Logging System
121 Conventional Logging System
261 Salvage Helicopter Logging Area
331 Group Selection Helicopter Logging Area
A Little Lagoon LTF Site
B Rabbit Cove LTF Site
C North Point LTF Site
D Hobart Bay LTF Site
Scale 1:140,000
Kilometers
Miles

Table 2-2
Estimated Total Road Construction Mileage

VCU	Alternative B	C*	D	E
79	4.2	13.5	0.0	0.0
80	4.0	4.0	2.6	0.0
81	0.0	9.6	0.0	0.0
82	24.6	34.1	24.0	14.0
83	28.7	20.6	30.2	35.0
84	2.4	4.6	3.0	18.4
85	0.0	0.0	0.0	0.0
86	2.7	3.5	1.6	3.5
87	6.8	4.0	6.5	6.8
88	0.0	0.0	0.0	0.0
89	15.5	17.3	16.7	16.8
Total	88.9	111.3	84.5	94.6

Source: Hemphill, 1995
*For Alternative C only, 0.6 miles of new road would also be constructed on Goldbelt, Inc. lands to access their road system and the Hobart Bay LTF.

area with more units in the North Shore and East Houghton areas. Total timber volume is 116.1 MMBF with 5,618 acres being harvested which includes timber logged in the road right-of-way.

This alternative has two proposed silvicultural methods with 68 percent of the unit volume being harvested as either clearcut or clearcut with reserves. About 31 percent would be cut as shelterwood with reserves and 12 percent as overstory removal. No sanitation salvage or group selection harvest areas are planned for this alternative.

The majority of the units (76 percent) would be harvested using conventional logging systems. No helicopter logging is planned for Alternative C. Three units would be harvested that are greater than 100 acres, and two of these units are greater than 150 acres.

Three new LTFs (Little Lagoon, Rabbit Cove, and North Point) are planned for Alternative C with 72 percent of the timber volume being transported through the Little Lagoon LTF (Table 2-1). The existing Hobart Bay LTF would be used to transport 11 percent of the timber volume. The remaining timber would be transported through new facilities at North Point (9 percent) and Rabbit Cove (8 percent).

Alternative C Summary			
Net Scribner MBF:	116,105	Total Road Miles:	113.3
Total Acres Harvested:	5,618	Specified Road Miles:	94.1
Number of Units:	97	New LTFs: Little Lagoon, North Point, Rabbit Cove	
Average Acres/Unit:	54	Existing LTFs: Hobart Bay	
Average Net MBF/Unit:	1,197		
Average Net MBF/Acre:	22		

This alternative has more road miles than any other action alternative with approximately 111 miles of road planned for construction (Table 2-2). Specified road construction would be utilized on 85 percent (94 miles) of these roads with the remaining 15 percent (17 miles) being temporary construction.

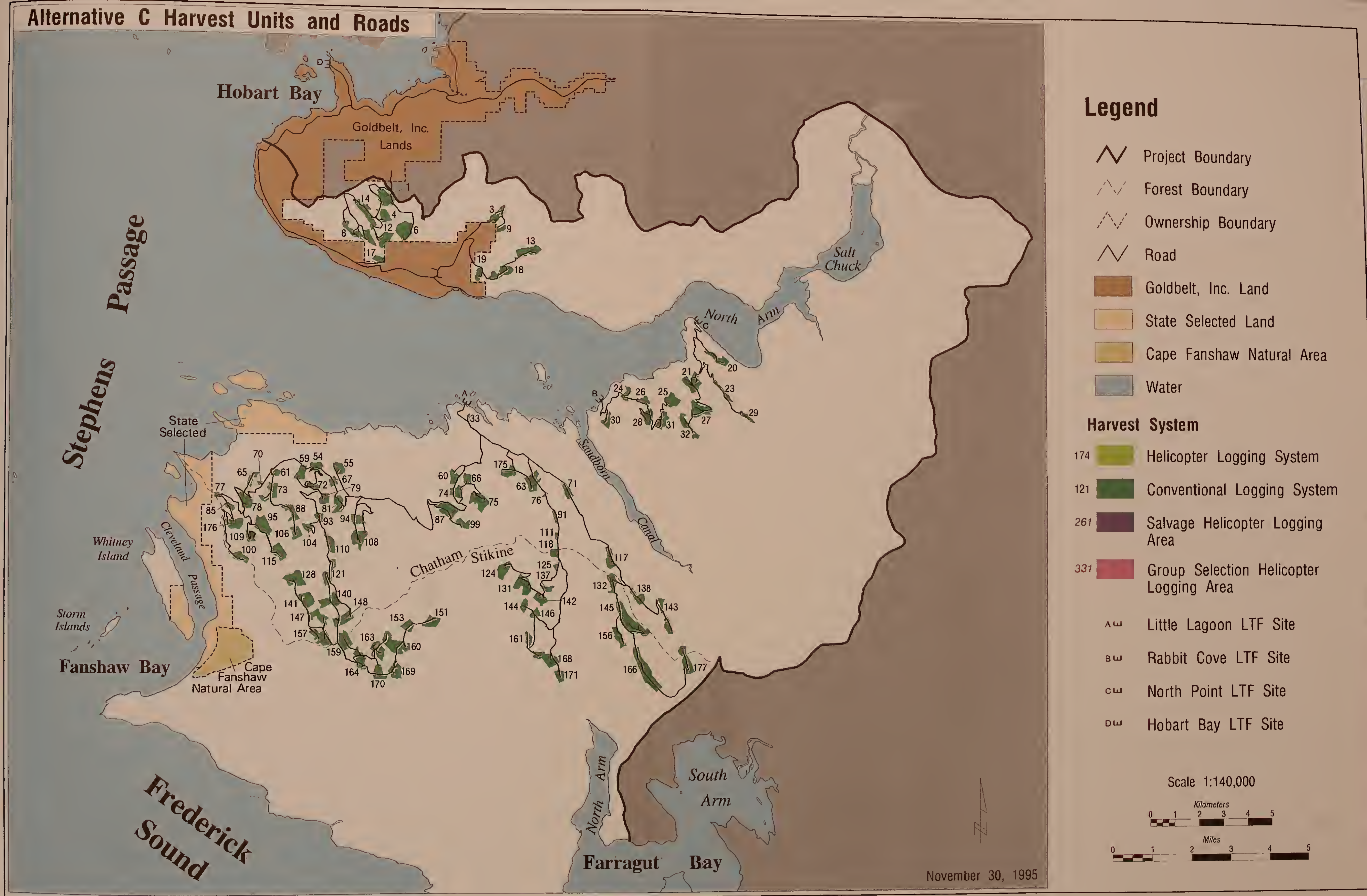
Alternative D

The primary objective of Alternative D is to minimize harvest in areas seen by the small boat traveler (see Alternative D map). Six helicopter units and one group selection area are planned at East Houghton where up to 50 percent of the overstory volume would be removed. Considerable harvest is planned in North Shore due to the existing visual conditions from the Goldbelt, Inc. land holdings. More alternative silviculture treatments (49 percent) are planned compared to other alternatives. Consequently, to achieve the required volume, more units and acres would be subject to harvest. The most helicopter logging and least road miles are planned for this alternative, which results in a higher cost for this alternative.

Alternative D has more harvest units and acres than any other action alternative with 120 units and 7,244 acres planned for harvest. The majority of the timber harvest and road construction for Alternative D would occur in the North Fanshaw portion of the project area, followed by South Fanshaw. In addition, 13 units are planned for harvest at North Shore and six units are planned for harvest in East Houghton. Total timber volume is 120.7 MMBF.

This alternative has five proposed silvicultural methods with 52 percent of the unit volume being harvested as either clearcut or clearcut with reserves. About 21 percent would be cut as shelterwood with reserves and 3 percent as overstory removal. Sanitation salvage is planned in 10 percent of the project area which would occur in the South Fanshaw area. This is the only alternative with group selection areas which are planned for 15 percent of the timber volume. These areas would be located in the North Fanshaw portion of the project area.

More helicopter harvest is planned for Alternative D than any other action alternative. However, the majority of the units (58 percent) would still be harvested using conventional logging systems. In addition to the three salvage areas and five group selection areas, 35 units are proposed to be harvested using helicopters. Two units would be harvested that are greater than 100 acres.



Alternative C Harvest Units and Roads
Hobart Bay
Goldbelt, Inc. Lands
Stephens Passage
Salt Chuck
North Arm
Sandborn Canal
State Selected
Whitney Island
Cleveland Passage
Storm Islands
Fanshaw Bay
Cape Fanshaw Natural Area
Chatham Stikine
Frederick Sound
North Arm
South Arm
Farragut Bay
November 30, 1995
Legend
Project Boundary
Forest Boundary
Ownership Boundary
Road
Goldbelt, Inc. Land
State Selected Land
Cape Fanshaw Natural Area
Water
Harvest System
174 Helicopter Logging System
121 Conventional Logging System
261 Salvage Helicopter Logging Area
331 Group Selection Helicopter Logging Area
A Little Lagoon LTF Site
B Rabbit Cove LTF Site
C North Point LTF Site
D Hobart Bay LTF Site
Scale 1:140,000
Kilometers
Miles

One new LTF (Little Lagoon) is planned for Alternative D with 91 percent of the timber volume being transported through the Little Lagoon LTF (Table 2-1). The existing Hobart Bay LTF would be used to transport 9 percent of the timber volume.

This alternative has the lowest amount of new road construction (Table 2-2). About 84.5 miles of road would be constructed to harvest and transport timber to the LTFs. Specified road construction would be used on 82 percent (69 miles) with the remaining 18 percent (15 miles) being temporary construction.

An additional marine area, needed for Alternative D only, is a helicopter drop zone where logs harvested in the area between Sandborn Canal and North Point would be dropped into the water from the helicopter. These logs would then be consolidated within bag booms and moved to the Little Lagoon LTF site for rafting and storage. The helicopter drop zone would be marked by buoys and lines in the water to ensure that all logs are dropped into the same area. The placement of bag booms for log drops from helicopters would be in waters of 60 ft or greater depth from the mean low water line (MLLW). The helicopter drop zone is needed because no road construction is planned in this area, and neither the Rabbit Cove nor the North Point LTF would be constructed for Alternative D.

Another option for this volume harvested between Sandborn Canal and North Point would be to drop the logs either into the water to be loaded onto a barge, or dropped directly onto the barge for transportation to the mill site.

Alternative E

The objective of this alternative is to select the most productive harvest units with the fewest road miles to allow the most optimum appraisal for the project area (see Alternative E map). This alternative most closely resembles the original proposed action after refinements based on field verification. Units are located in Sandborn Canal where the highest timber volumes occur. Costly road building is eliminated in the region of a goshawk nest. Minimal alternative silvicultural treatment is planned. The most timber volume would be removed for this alternative at the lowest cost.

Ninety-eight units are planned for harvest in Alternative E. The majority of the timber harvest and road construction for Alternative E would occur in the North Fanshaw portion of the project area, followed by South Fanshaw. No harvest would occur in either North Shore or East Houghton. This alternative has the highest timber volume being logged on the fewest acres. Total timber volume is 123.2 MMBF with 5,471 acres being harvested.

This alternative has two proposed silvicultural methods with 93 percent of the unit volume being harvested as either clearcut or clearcut with reserves. About 7 percent would be cut as shelterwood with reserves. No sanitation salvage or group selection harvest is planned.

Alternative D Summary			
Net Scribner MBF:	120,679	Total Road Miles:	84.5
Total Acres Harvested:	7,244	Specified Road Miles:	69.4
Number of Units:	120	New LTF: Little Lagoon	
Average Acres/Unit:	58	Existing LTF: Hobart Bay	
Average Net MBF/Unit:	1,006		
Average Net MBF/Acre:	17		

All units would be harvested using conventional logging systems. There would be no helicopter logging. Six units would be harvested that are greater than 100 acres, and two of these units are greater than 150 acres.

One new LTF (Little Lagoon) is planned for Alternative E with 100 percent of the timber volume being transported through the Little Lagoon LTF (Table 2-1).

Approximately 95 miles of road would be constructed to harvest and transport timber to the LTF (Table 2-2). Specified road construction would be utilized for 84 percent (80 miles) with the remaining 16 percent (15 miles) being temporary construction.

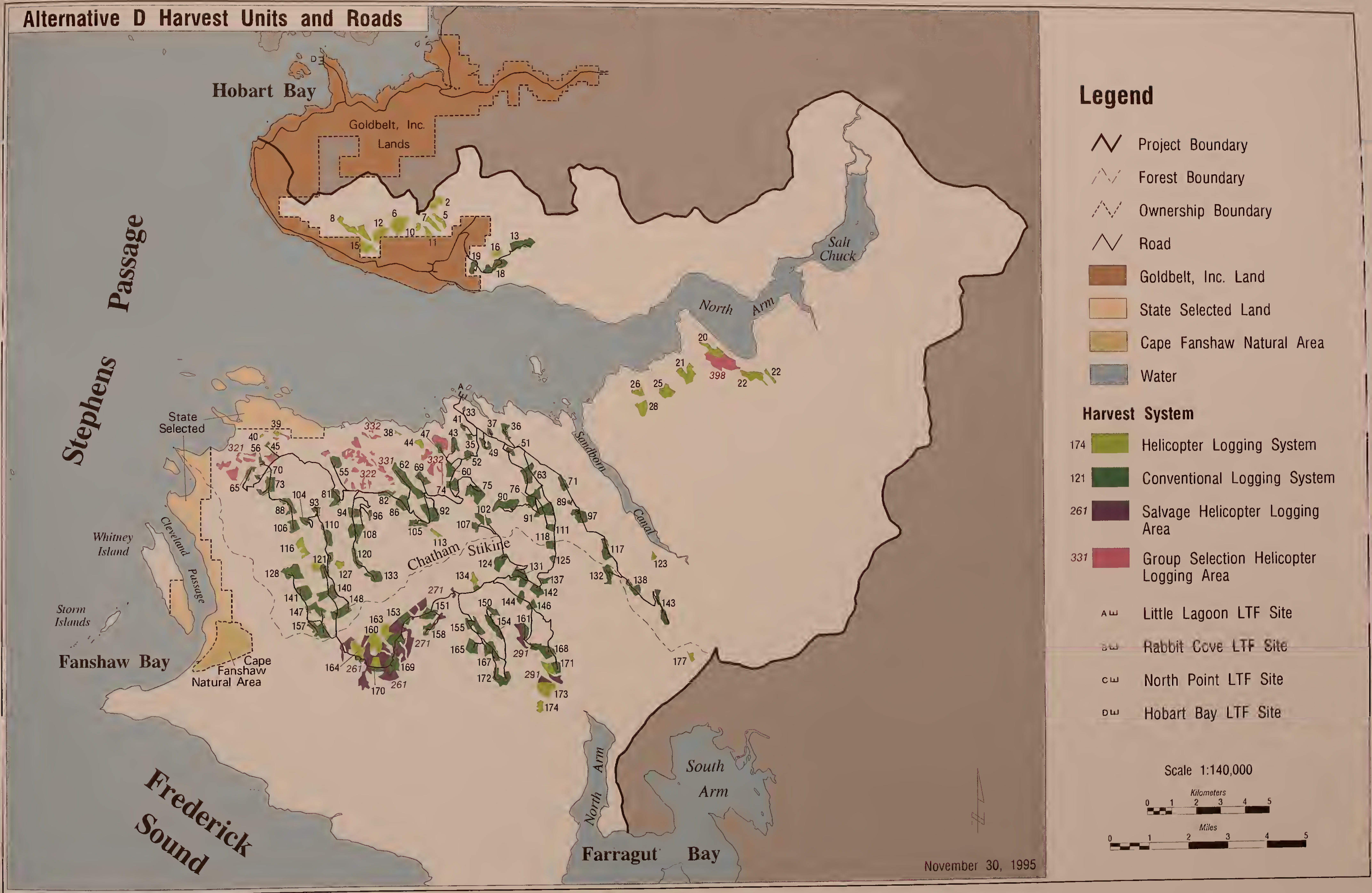
Road Options

Because of the proposed location of the main haul road (8494) for all action alternatives near the 1994 Sandborn goshawk nest, two options to this location can be considered (Table 2-3).

One option, known as Modification #1 (Figure 2-5), would reroute the road and place it further from the location of the 1994 nest site. The modified route would require approximately 2,923 ft of additional road construction, and because of adverse grades, haul cost would be slightly greater. If this modified location were implemented, units 333087 (89) and 333088 (97) may be dropped to improve economics and/or to further minimize potential impacts to the goshawk nest.

Another option, which would only be applicable to Alternative C, is Modification #2, and known as the Road 6122 option as shown in Figure 2-6. The 6122 road would be constructed as well as road 84940. The 8494 road would not be constructed from unit 333082 (71) to the junction of the roads between units 33301 (132) and 341102 (138).

The amount of road constructed on both modified routes and the haul costs would be about equal to the originally proposed routes as shown in Alternatives B, C, D, and E. Construction costs and the terrain factors are about equal on all three routes.



Alternative D Harvest Units and Roads
Hobart Bay
Goldbelt, Inc. Lands
Stephens Passage
Salt Chuck
North Arm
Sandborn Canal
State Selected
Whitney Island
Cleveland Passage
Storm Islands
Fanshaw Bay
Cape Fanshaw Natural Area
Chatham Stikine
Frederick Sound
North Arm
South Arm
Farragut Bay
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B Rabbit Cove LTF Site
C North Point LTF Site
D Hobart Bay LTF Site
Scale 1:140,000
Kilometers
Miles

Table 2-3
Comparison of Modification Routes 1 and 2*

Proposed Road Route	Miles of Road to be Constructed	Remarks
Alternative B, C, D, E	0.8	Proposed road route for action alternatives
Modification #1	1.3	Can be used on all action alternatives
Modification #2 (6122 option)	2.8	Can be used on Alternative C, unless other changes are made.

* This table only compares the affected portion of roads in the action alternatives to the two modifications.

Actions Common To All Action Alternatives

All action alternatives would include building roads and LTFs, harvesting timber, and providing camp facilities for workers. For each of these activities, a range of options and methods is described below.

Roads

Timber harvest in Southeast Alaska typically requires a road network to transport logs from harvest units to LTFs. This network consists of specified and temporary roads built to appropriate standards to support the planned traffic and to minimize environmental impacts. Roads are normally intended to provide long-term access for recurring resource management activities. Temporary roads are constructed (when needed) for one-time, short-term harvest access. These roads generally serve only one or two harvest units. After log haul is completed, temporary roads are deactivated by water barring the roadbed and removing drainage structures. Planned road construction mileages are shown for each alternative in Table 2-2.

Where roads cross streams in the project area, culverts or bridges are planned to allow continuous stream flow. Bridges are proposed where (1) large volumes of water must be crossed, (2) there is a heavy bedload of woody debris or rock, and/or (3) fish habitat protection is necessary. Bridges are proposed for all crossings of Class I streams and about 50 percent of Class II streams.

Bridges on specified roads would be designed to pass a 50-year flood event. Bridge construction materials would include steel, concrete, treated timber, and log stringers. Bridges built on temporary roads would be removed when the road is deactivated. Culverts would be installed in small drainages to provide relief drainage under the road when needed. Culverts would be sized for a 50-year flood event, with additional allowance for bedload passage. Culverts placed in Class II streams would be installed to permit fish passage if fish would be present.

Alternative E Summary			
Net Scribner MBF:	123,176	Total Road Miles:	94.6
Total Acres Harvested:	5,471	Specified Road Miles:	79.5
Number of Units:	98	New LTF: Little Lagoon	
Average Acres/Unit:	53	Existing LTF: None	
Average Net MBF/Unit:	1,257		
Average Net MBF/Acre:	24		

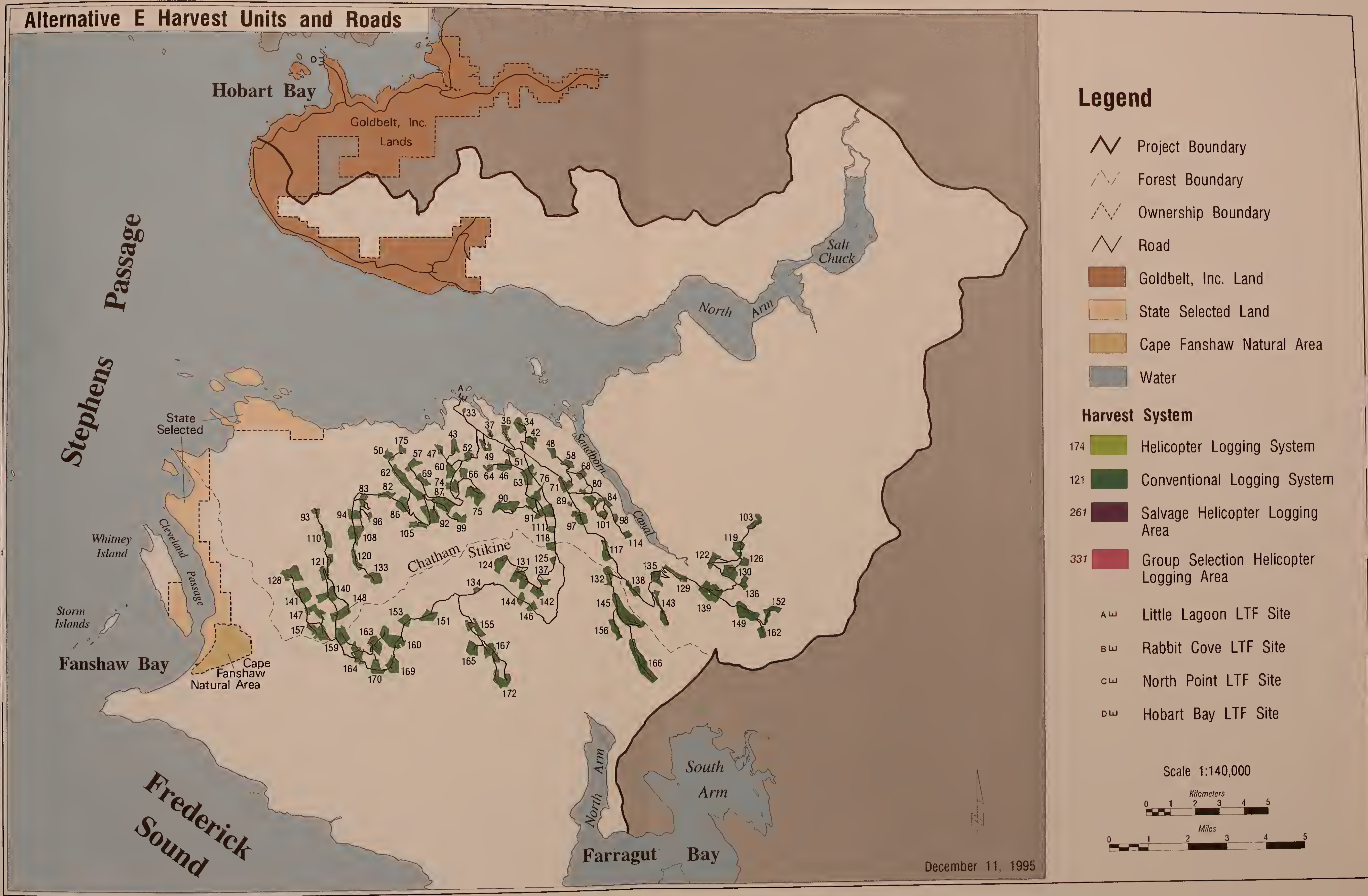
Both the TTRA and TLMP require that BMPs be used to prevent degradation of streams during and after road construction and road deactivation. The BMPs prescribe numerous timing and construction constraints for instream construction work. Fish passage requirements for Class I and II stream crossings are also specified. BMPs for this project are considered standard operating procedures, and would be applied automatically.

Following construction, the road system would be managed to provide the necessary access to meet land use objectives and activities. Environmental protection, user safety, and preservation of improvements for future use are all considered when formulating a road management plan. Roads may be physically or administratively closed, obliterated, or maintained open. Commonly used methods of road closure include signing, barricading, gating, and alder encroachment. Roads that are permanently closed would have all drainage structures removed to provide free passage of storm runoff. Rock can be removed from temporary roads and used in other road construction.

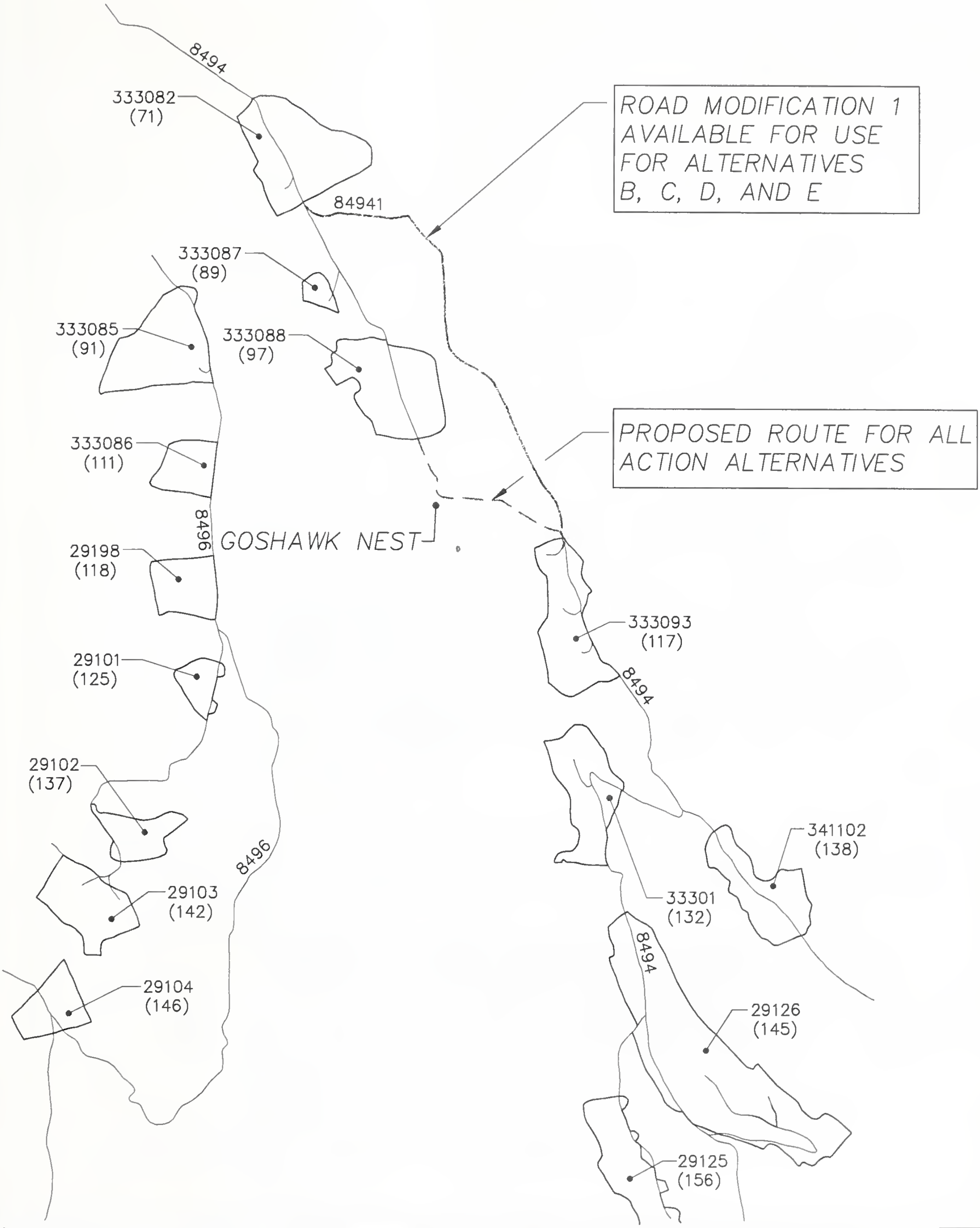
Log Transfer Facilities

Up to three new LTF sites were identified for timber transport in the project area (see alternative maps for locations), in addition to planned use of the existing Hobart Bay LTF site on Goldbelt, Inc. lands for units in the North Shore portion of the project area. Two LTF sites were identified in the East Houghton portion of the project area because of the difficulty of a road connection through topographical constraints. The volume of timber transferred from each LTF site varies by alternative (Table 2-1) with the majority of the timber being transferred through the Little Lagoon site.

Four primary methods are used to transfer logs from land to marine transportation. Logs are transferred singly or in bundles. The following types of LTFs were analyzed for this project, however, the low angle ramp and slide is preferred at all three sites.



Alternative E Harvest Units and Roads
Hobart Bay
Goldbelt, Inc. Lands
Stephens Passage
Salt Chuck
North Arm
State Selected
Whitney Island
Cleveland Passage
Storm Islands
Fanshaw Bay
Cape Fanshaw Natural Area
Chatham / Stikine
Sandborn Canal
Frederick Sound
North Arm
South Arm
Farragut Bay
December 11, 1995
Legend
Project Boundary
Forest Boundary
Ownership Boundary
Road
Goldbelt, Inc. Land
State Selected Land
Cape Fanshaw Natural Area
Water
Harvest System
174 Helicopter Logging System
121 Conventional Logging System
261 Salvage Helicopter Logging Area
331 Group Selection Helicopter Logging Area
A Little Lagoon LTF Site
B Rabbit Cove LTF Site
C North Point LTF Site
D Hobart Bay LTF Site
Scale 1:140,000
Kilometers
Miles



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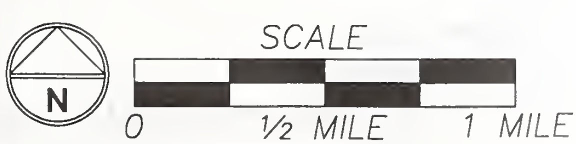


Figure 2-5
Modification 1
To Avoid Goshawk Nest

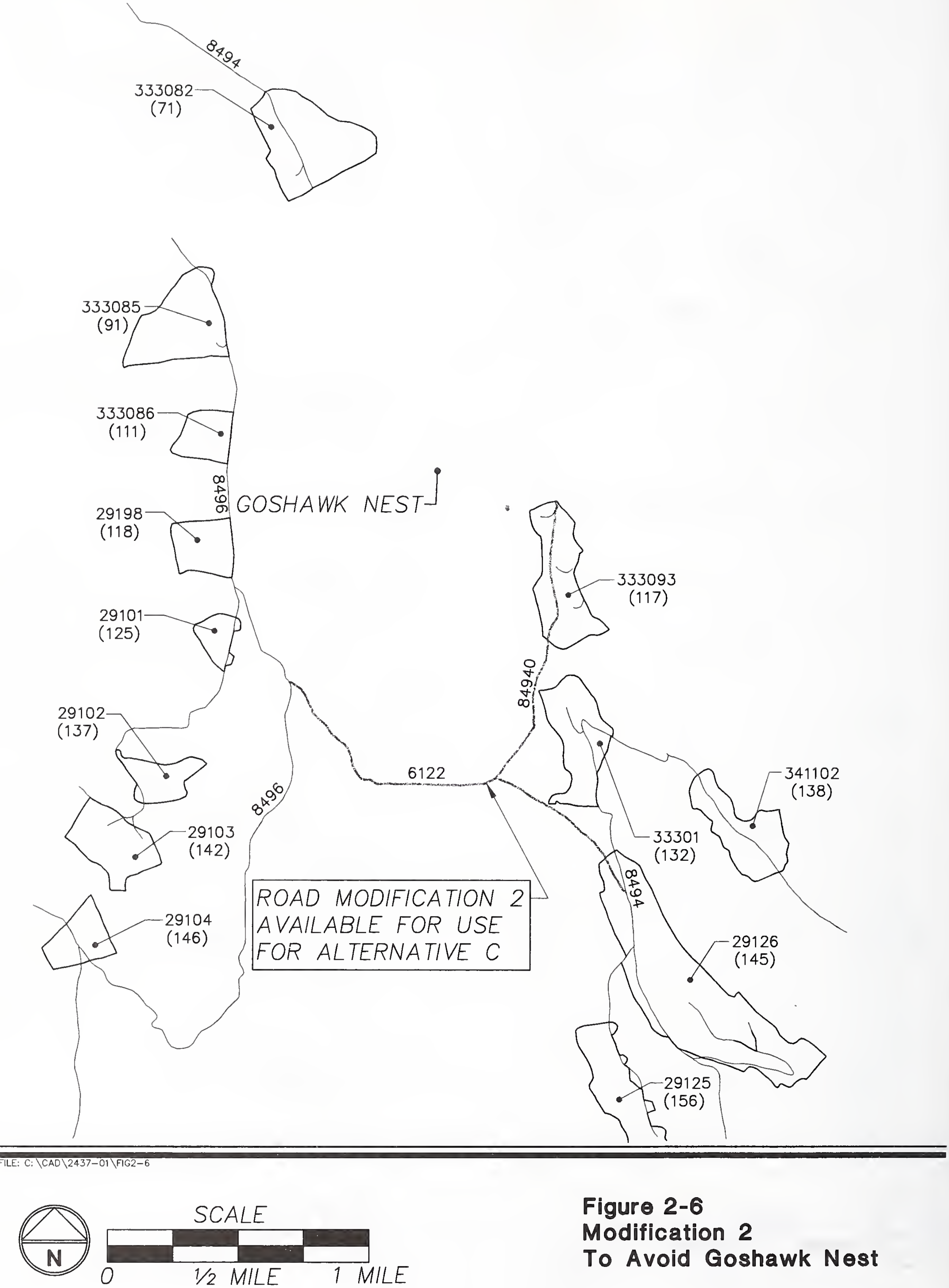


Figure 2-6
Modification 2
To Avoid Goshawk Nest

Low-Angle Ramp and Slide

Ramp - The low angle ramp is constructed on a 10-12 percent grade, utilizing shot rock. The running surface width of the ramp varies from 20 feet, for a 1-2 year operation, to a width of 30 feet for longer life. The design includes armor rock for protection from wave action. The low end of the ramp terminates at a -2.0 foot elevation. A log stacker or front end loader carries the log bundle down to the ramp and places the bundle in the water. The ramp has a low profile and blends in with the surrounding terrain. Construction costs are low ($5-15,000) and the footprint is kept to a minimum (less than 0.25 acre). Velocity of entry for the log bundles into the water is considered zero.

Slide - The low angle slide is constructed on a not to exceed 12 percent grade, utilizing shot rock. The running surface width of the ramp is typically 30 feet. Steel pipe rails are placed on the ramp. The low ends of the rails terminate at a -2.0 foot elevation and the top end of the rails is +15.0 feet. A log stacker or front end loader places the log bundles on the rails and pushes the bundles down the rails till they float off. The low angle slide has a low profile and blends in with the surrounding terrain. Construction costs vary depending on the site conditions ($50-80,000). Between periods of nonuse, the rails can be taken out and used on other sites. The footprint is kept to a minimum (less than 0.25 acre). Velocity of entry for the log bundles into the water is less than 3 ft/sec.

Bulkhead

Bulkheads are used as a platform to place log bundles directly into the water for rafting or onto a barge. Bulkheads have been constructed from a variety of materials of which the most common is the native log crib. Steel rail cars and sheet piling are two other types of material in use.

A-Frame or Crane - Bulkheads used to transfer logs directly to the water for rafting are sited in water depths of as little as -2.0 feet with a top elevation of +22-24 feet. The face of the bulkhead is 60-80 feet wide. An A-frame or crane is used to lift the log bundles off the trucks and lower them into the water. Entry velocity is controlled by the design of the system and the operator. The area of intertidal fill depends on the slope of the shoreline (less than 0.50 acre). Large quantities of shot rock fill are needed. This type is suited for beaches with steep gradients. Construction costs range from $40-80,000, excluding the cost of the hoist and A-frame. The visual profile is higher than for the ramp type.

Small Barge - Bulkheads used to transfer logs to a small barge are sited in water depths of -12.0 feet with a top elevation of +12.0 feet. The face of the bulkhead is 30-40 ft. wide. Construction costs are low and range from $10-20,000. The footprint is kept to a minimum (less than 0.25 acre). This bulkhead can be used also for equipment off-loading, minimizing impacts to the intertidal waters. Small barges carry approximately 250-500 MBF.

Large Barge - Bulkheads used to transfer logs to a large barge are sited in water depths of -20 to -24 ft. with a top elevation of +24.0 feet. The face of the bulkhead is 40 feet wide. Construction costs are high and range from $150-300,000. The footprint is usually less than 0.40 acres. The large barge bulkhead also requires a separate equipment off-loading facility. Large barges typically carry approximately 1-2 MMBF. This facility is designed for permanent installations and has a 40-50 year design life.

Sort Yards

The recovery of optimum value from the forest typically requires that logs be sorted before marine transportation. Increasingly, this is done on land, instead of in the water. Ample land area is available at several alternative sites near the proposed Little Lagoon LTF, and operators might also elect to construct a sort yard 1 to 3 miles south of the LTF, if desired (Appendix K). An area of 3-5 acres would be cleared and rocked for this purpose. The Rabbit Cove LTF has only 2 acres available for a sort yard, and North Point LTF has only 3 acres. For these latter sites, it is likely that logs would be sorted on the water in log rafts. Visual screening from the beach for all three sites would be achieved by the topography and/or a 100-foot buffer of standing timber (Appendix K).

Ancillary facilities usually sited at a sort yard, or else at the camp, would include rough-lumber buildings for equipment storage and repair, small administrative buildings, a diesel generator, and fuel storage tanks.

Camps

An estimated work force of between 50 and 150 would be needed to harvest the timber in the action alternatives. These people and the families of some would be housed in either a land or floating camp. If a land-based camp is proposed by the operator, it would likely be constructed during the first year of operations, while roads are being built. Normally, camps are sited as close as possible to LTFs without being so close as to interfere with operations. Camps must also be adjacent to a fresh water supply of sufficient quantity and quality. Camps must be accessible to boats and float planes, and must be sheltered from storms.

A land camp would require the clearing of an area of 10-20 acres. The only area of suitable contour that meets all camp criteria is adjacent to Little Lagoon (Appendix K). Living and office space would be within modular structures and mobile homes. Garbage would be disposed of in an incinerator. Sewage would be disposed of in a drain field. A diesel generator would provide electricity.

The other proposed LTF sites do not have sufficient land of appropriate topography suitable for a land camp. The work force for these sites would either be housed in a land camp at Little Lagoon, commuting daily, or a floating camp would be used in one or more of the three LTF locations. Floating camps are constructed either on a large log raft, or on a barge. These camps would have either self-contained or shore-based water treatment and storage facilities, and self-contained sewage treatment facilities. Garbage would be incinerated. A catwalk permitting direct access to the road system would be desirable. Camps would be managed in accordance with applicable law.

The likelihood of ice in winter would preclude year-round siting of a floating camp at North Point, but this could be considered at the other two locations.

Windfirm Boundaries

All units were designed to minimize windthrow. Boundaries are located around topographical features and vegetative conditions that provide protection from wind. Natural windfirm areas, such as muskegs, are used as boundaries when available.

Water Quality

The TTRA requires a buffer zone no less than 100-ft wide on each side of all Class I streams and on those Class II streams that flow directly into Class I streams. This feature is incorporated into all action alternatives where harvest units are adjacent to these streams. The streams and their respective buffers are located outside of harvest units. Measures to protect other streams include similar buffer areas, directional falling of trees away from streams, partial or full suspension of logs, split-yarding, and removal of logging debris from stream courses.

Cultural Resources

Mitigation of adverse effects to significant sites would follow the procedures set forth in Section 1.6 of the National Historic Preservation Act of 1966 and 36 CFR 800. Following these procedures would ensure that the public's concerns about cultural resources are effectively mitigated. This includes data collection, site protection and preservation, as well as confidentiality of site information.

Enhancement Opportunities

Fisheries and recreation enhancement projects may be possible through funding under the Knutson-Vandenburg (KV) Act. This Act allows the Forest Service to collect receipts from timber sales for Sale Area Improvement (SAI) projects. The SAI plan may consider one or more fisheries or recreation enhancement projects. See Appendix J for specific enhancement opportunities.

Comparison of Alternatives by Identified Issue

The comparison of alternatives draws together the conclusions from the materials presented throughout this EIS, and provides the results of the analysis in a brief

summary. The following sections provide a comparison of alternatives by identified issue, proposed activity, and environmental consequence. The baseline for comparing the alternatives is Alternative A, the no-action alternative which also represents existing conditions. Chapter 4 contains the detailed evaluation of the potential effects on the natural and social resources from timber harvest and road construction under each alternative.

Several features of the action alternatives address various components of the issues, and allow a comparison of the effects of different ways of addressing those components. This section provides a comparison of the alternatives based on the issue components they address.

Issue 1: Timber

No significant changes in timber volume class, plant associations, and dispersion of forested areas in the project area would occur for the no-action alternative. The only existing clearcuts in the project area occur on Goldbelt, Inc. land. The timber volume of old-growth forest that would be harvested would range from a low of 116 MMBF (net scribner volume) for Alternative C to a high of 123 MMBF for Alternative E. Timber volumes for Alternatives D and B would be 121 MMBF and 122 MMBF, respectively (Table 2-4).

The acreage harvested does not directly correlate with the volume harvested because some alternatives have partial harvest units which results in less timber volume removed over a greater area compared to a clearcut harvest. As a result, Alternative E (which is entirely clearcut) would have the lowest acreage logged (5,471 acres, including road right-of-way), while Alternative D (which has more partial harvest units) would have the highest acreage logged (7,244 acres). Acreage harvested for C and B are 5,618 and 6,037 acres, respectively. Timber harvest planned in the project area would effect from 6 to 9 percent of the commercial forest land, and is directly correlated with acreage harvested.

The location of harvest varies among alternatives with Alternative E located in a more confined area within North Fanshaw and the northern portion of south Fanshaw. This alternative also includes harvest in the Sandborn Canal drainage area. All other action alternatives additionally include harvest in the North Shore and East Houghton areas but generally exclude harvest in the Sandborn Canal drainage area. The amount harvested by timber volume class is slightly different with Alternative D having 7-8 percent more harvest in timber volume class 4 and Alternative E having more harvest in volume classes 5 and 7. However, differences among alternatives concerning volume proportionality are not significant, and are less than 1 percent. Harvest by tree species composition is approximately 64 percent western hemlock, 16 percent Sitka spruce, 14 percent Alaska yellow cedar, and 6 percent mountain hemlock for all action alternatives. Alternative E has slightly more western hemlock and less mountain hemlock than the other action alternatives.

Issue 2: Alternative Silviculture

The silvicultural methods for Alternative E are either clearcut and clearcut with reserve areas (93 percent) or shelterwood with reserves (7 percent). Similar to Alternative E, Alternative C also includes two major silvicultural methods, but has a greater proportion of harvest as shelterwood with reserves (32 percent) and less clearcut area (68 percent) than Alternative E. In comparison, Alternatives B and D have five silvicultural methods with clearcut and clearcut with reserves representing less (59 and 52 percent, respectively) of the harvested area. These alternatives additionally include group selection, sanitation salvage, and overstory removal.

Issue 3: Marine Values

Logging-associated disturbances in marine waters would occur in Port Houghton for all action alternatives. No marine disturbances would occur in the vicinity of Farragut Bay. These disturbances are related to construction and use of LTFs. Alternative E would result in the construction of one LTF (Little Lagoon) with the greatest amount of timber volume being transported at this site compared to the other action alternatives. The other action alternatives would also require development of this LTF site but with less volume being transported. These alternatives would additionally require use of the existing Hobart Bay LTF site and construction of the Rabbit Cove (Alternatives B and C) and North Point (Alternative B) LTFs. However, these latter two LTFs would be considerably smaller, temporary (one-time use) facilities. The Little Lagoon LTF site would be constructed for long-term usage. Impacts from LTF development include fill (less than one acre at each LTF site), bark deposition and dispersion (less than one acre at each LTF site), and shading below log rafts and floating camps. Commercial fisheries would be temporarily displaced while barges move through Port Houghton.

Issue 4: Wildlife

Most of the 12 wildlife MIS (excepting the hairy woodpecker and black bear) carrying capacities would decrease from 0 to 7 percent under each action alternative compared to existing conditions. No changes in carrying capacity are predicted for the gray wolf, land otter, and bald eagle. Carrying capacity decreases are predicted to be up to 8 or 9 percent for the black bear and 7 to 9 percent for the hairy woodpecker. In comparing carrying capacity decreases among all action alternatives, there are no wildlife species that have greater than a three percent difference change in carrying capacity between alternatives.

The three northern goshawk nests observed in the project area have been protected, although unites and roads occur near Post-Fledging areas. Alternative D has the most units and roads (184 acres) within a 600-acre core radius of

goshawk nests than Alternative C (145 acres), E (136 acres) and B (97 acres). All action alternatives would have old-growth forest within Foraging Areas of 45 percent or greater following harvest (the minimum recommended in the 1994 draft goshawk guidelines is 20 percent).

Issue 5: Biodiversity

About 220 old-growth patches occur in the project area under existing conditions (Table 2-5). This number would be increased to a low of 585 patches (Alternative B) up to a high of 597 patches (Alternatives C and D). The average size of old-growth forest patches is 223 acres under existing conditions, and would decrease to a low of 80 (Alternatives B, C, and E) or a high of 84 (Alternative D) acres. The largest old-growth patch is 12,400 acres under existing conditions that would decrease to a low of 3,912 acres (Alternative C) to a high of 6,237 acres (Alternatives D and E). Interior area within old-growth patches is about 20,000 acres under existing conditions that would decrease to about 15,300 acres under all action alternatives.

Issue 6: Fish Habitat

The amount of road construction miles in stream buffers for the action alternatives ranges from a low of 1.7 miles (Alternative D) to a high of 2.0 miles (Alternatives C and E). Alternative E has more Class I and II stream crossings (38 crossings) compared to the other action alternatives (Table 2-5). The most streams (including Class III) would be crossed under Alternative C (97) than the other action alternatives (see Table 2-5). All action alternatives have a similar amount of acres within the rain-on-snow elevation zone (approximately 4,600 acres). The total increase in sediment yield from roads over background conditions is similar among action alternatives and is generally less than 20 percent. The harvested area in high potential erosion class soils is also similar among action alternatives, and is about 2,150 acres.

Issue 7: Soils

No harvest units or roads would be located in Very High Hazard soils. More High Hazard soils would be disturbed in harvest units under Alternative E (1,914 acres) than the other action alternatives which are up to 328 acres less (Alternative C) than this alternative. In contrast, more High Hazard soils would be disturbed for road construction under Alternative C (119 miles) than the other action alternatives which are up to 23 percent less (Alternative D). Alternative C also has more unit and road area that occurs on steep slopes, although the amount is less than 3 miles and 84 acres, respectively. Soil disturbance is greater for Alternative D, and is directly related to acres harvested for all alternatives.

Issue 8: Subsistence

Consumption and subsistence use of the edible resources in the project area is not expected to change from existing conditions for all action alternatives. Presently, there is a low level of subsistence harvest due to the substantial distance of the project area from most user communities. However, new road access could increase subsistence harvesting of big game, and there is the potential that, as big game decrease elsewhere in the Tongass National Forest and communities increase in size, hunters may travel further distances for their subsistence harvest, particularly for deer.

Issue 9: Cultural Resources

Impacts are anticipated to be low for Alternatives B and D, moderate for Alternative C and E. For Alternative D, there is a potential for impacts to occur to one prehistoric site recently found near Sandborn Canal. For Alternative C, there is a potential for impacts to occur to one prehistoric site recently found near the North Point LTF site.

Issue 10 and 11: Recreation and Visual Resources

The most substantial changes that would occur to recreation resources are the decreases in primitive ROS and simultaneous increases in semi-primitive motorized and roaded modified acres. About 44,000 acres would change in ROS for the action alternatives. Alternative D would have a greater decrease in primitive acres compared to the other action alternatives. Differences can be directly correlated with acreage harvested. Visual quality objectives would be met for Alternatives D and E, but would not be met for some areas in Alternatives B and C. For Alternative B, the VQO of partial retention would not be met in Port Houghton or Inner Port Houghton. For Alternative C, the VQO of partial retention would not be met for Inner Port Houghton or the Salt Chuck Antechamber.

Issue 12: Financial Returns

Alternative E would result in a greater net stumpage value, more jobs generated, and a greater increase in regional income. The estimated current net stumpage value (120 $/MBF) is almost twice as much as Alternative B (64 $/MBF); the alternative that has the next highest amount, although the jobs and regional income generated are similar. Alternative D has the lowest net stumpage value (10 $/MBF) and Alternative C is intermediary between B and D (48 $/MBF) (see Table 2-5).

Mitigation Measures

The Forest Service uses mitigation and preventive measures in the planning and implementation of land management activities. The application of these measures begins during the planning and design phases of a project. They link to the overall Forest, Administrative Area, and Ranger District management direction and continue through all phases of subsequent forest management. The standards, guidelines, and direction contained in the current TLMP as amended, the Supplement to the Draft EIS for the TLMP Revision (1991), TTRA, Alaska Regional Guide, and applicable Forest Service manuals and handbooks have been used in the development of alternatives and design of harvest units and roads. Mitigation is described in detail in Appendix L.

Timber

Several silvicultural approaches have been developed for this project to mitigate concerns relative to tree species succession, wildlife habitat, cedar decline, tree infection, and windthrow. These concerns are mitigated through selection of regeneration methods that optimize natural disturbance regimes. The following problems have been analyzed for each unit. See unit cards for site specific recommendations (Volume 2, Appendix A).

Cedar decline is believed to result in a unidirectional succession that ultimately results in a climax community of bog or muskeg (Bormann 1989). This is caused by podzol formation, nutrient immobilization, and lack of soil disturbance. A technique to decrease cedar decline is deep mixing of the soil to restore soil productivity. For areas that have been identified with cedar decline, the proposed project would use deep mechanical disturbance (through windthrow) to bring mineral soils to the surface. Several areas have been identified where this technique can be applied.

Increases in western hemlock regeneration and overstocked stands generally occur in logged areas of Southeast Alaska. This results in a decrease in Sitka spruce density compared to natural conditions. Recommendations to reverse this process are to expose mineral soils that provide a seedbed for Sitka spruce and Sitka alder. These new stands tend to have a rich understory flora that benefits wildlife. After the short-lived alder die out (40-80 years), the spruce is not likely to require thinning. Site productivity is increased since the alder fixes atmospheric nitrogen that is available for plant growth. Podzols are unlikely to develop in these stands if this prescription is followed. Five units in the project area offer the greatest potential for successful regeneration response of spruce and alder.

Hemlock dwarf mistletoe (*Arceuthobium tsugense*) infects many western hemlock stands in the project area. Techniques to reduce dwarf mistletoe in new stands include clearcutting infected stands, insuring that infected trees are not remaining at unit perimeters to infect new stands, using larger units in infected stands to reduce the relative amount of area exposed to infected trees, using partial cut methods in areas without infected trees, cleaning heavily-infected stands after

logging, and deferring cleaning of lightly-infected stands until precommercial thinning to allow this latter treatment as an opportunity to clear the stand of mistletoe.

Windthrow is the dominant natural disturbance mechanism in Southeast Alaska. The challenge of project design is to minimize the economic losses associated with windthrow while, at the same time, realizing some of the ecological benefits for wind as a disturbance mechanism. Windthrow was considered at the group level for sanitization salvage and group selection, and at the unit level for units designated as clearcut, clearcut with reserves, and shelterwood with reserves. Unit shape and orientation were modified to reduce likelihood of blowdown, except in areas where blowdown was preferred to allow ecological disturbance. Windthrow was considered both for avoidance and disturbance opportunities.

Marine

Alaska Terminal Transfer Facility (ATTF) guidelines delineate the physical requirements that are necessary to construct and operate an LTF for the protection of marine resources. The guidelines include BMPs and mitigation measures that decrease environmental impacts from LTFs, log raft areas, and adjoining facilities. These guidelines include selecting a log entry system that represents the best practicable alternative which minimizes impacts from fill placement. Fill structures at the LTF site should be designed and constructed to avoid introducing fine sediments and organic matter into the water. Silt curtains should also be used for this purpose.

In-water construction, blasting, and filling should be timed to avoid impacts to marine and anadromous fisheries resources. Disposal of solid wastes should follow 18 Alaska Administrative Code (AAC) 60, which requires that solid waste be properly disposed of at an approved disposal site. Threshold limits are imposed on bark accumulation levels as a condition of permits. The speed at which log bundles enter the water when a low-angle ramp system is used should be the slowest practicable speed achievable. The log transfer system and sort yard handling equipment should be operated and maintained to minimize petroleum and lubricating products from entering marine waters. All of the recommended marine protection measures above would be implemented for all action alternatives (see Appendix K).

Wildlife

Mitigation measures recommended for wildlife include habitat preservation and wildlife habitat retention acres. The latter attribute involves protection of wildlife habitat through TTRA buffers, beach fringe and estuary buffers, whereas habitat preservation includes six areas within the project area that have been avoided for timber harvest due to their importance to old-growth-dependent wildlife species. Silvicultural prescriptions include implementation of several measures favorable to some species of wildlife. These measures are slash retention, snag retention, green tree retention, and unit feathering. Several roads have been recommended for closure to protect the area from over hunting, particularly for mountain goats.

Construction and operational timing measures are also recommended. Specific species mitigation measures have been recommended for seabird rookeries, sharp-shinned hawk, mountain goat, great blue heron, wolf, and bald eagles. Protection of the northern goshawk will be done in accordance with existing requirements.

Fish, Water Quality and Soils

Minimum 100 ft. stream buffers were established on all qualifying Class I and II streams. In addition, increased buffers are located along these streams in areas where additional protection measures are needed, such as large floodplains, steep slopes, and areas of landslide potential. For V-notches, site-specific measures are recommended. These include directional felling, split yarding, and partial or full suspension logging methods. In other situations, the V-notches may represent setting boundaries, or the unit boundaries avoid these areas. Timing windows are also recommended for road construction. Mitigation specific for soils has included avoidance of very high hazard soils and use of erosion control measures for road construction.

Subsistence

Mitigation measures specific to subsistence includes avoidance of several areas where harvest occurs for subsistence resources. In addition, the Alaska Department of Fish and Game (ADF&G) may choose to limit the use of motorized vehicles in the project area during and after timber harvest.

Cultural Resources

Contractors and subcontractors would be informed of their responsibilities regarding findings relevant to cultural resources. Strict enforcement of the non-disclosure policy of cultural site locations would occur, as well as enforcement of the provisions of applicable laws. Site-specific mitigation measures include developing a mitigation plan for a site that is a multi-component prehistoric site. If the site is not avoided by an action alternative, then data recovery (salvage excavation) may be required. Mitigation of another prehistoric site would be most appropriately accomplished by avoidance. If that is not possible, then additional documentation of the site is recommended. For culturally modified trees, it is recommended that a small percentage of the old bark removal scars are preserved from selected trees that are otherwise cut.

Recreation and Visual Resources

Comments received during public scoping indicated that most people travel to the project area because it provides a primitive and semi-primitive recreation experience in an unmodified landscape. To reduce the impact of harvesting activities on this type of recreation experience, it is recommended that some of the road system be closed and not maintained after harvest.

Units are designed to mitigate potential visual impacts by incorporating components such as avoiding square corners and rigid geometry, avoiding thin screens of trees on ridgelines, following natural land forms with openings, avoiding long horizontal lines, having irregular clearing edges, and maintaining key viewsheds. For small boat users, the visual impacts would be most apparent in the Port Houghton viewshed where the view is already affected by the existing clearcuts on private land. Supporting facilities at LTFs would be screened by a

buffer of shoreline trees of at least 100 ft wide, where practicable. None of the action alternatives propose units or roads in the areas with high or exceptional visual quality. Alternative silviculture methods that involve partial cutting are recommended to reduce visual impacts by softening the alteration to forest cover. Helicopter logging has also been recommended to eliminate the need for roads which otherwise create the most significant and long-lasting visual impact.

Monitoring

Monitoring would be conducted to determine whether resource management objectives have been met. Monitoring results would be used to verify implementation and effectiveness of selected mitigation and protective measures in a timely manner. The monitoring plan recommended for this project is provided in Appendix E.

Identification of Forest Service Preferred Alternative

The Forest Service has identified Alternative B as the Preferred Alternative. This alternative, as well as the other alternatives, will be examined before preparation of a Final EIS (FEIS), taking into consideration public comments as well as additional information and analysis. To be most useful, comments on this Preferred Alternative and the other alternatives in this DEIS should focus on particular aspects of the alternatives that the reviewer either likes or dislikes. The final selected alternative may be the same as the Preferred Alternative, a modified version of the Preferred Alternative, or an entirely different alternative.

Note

During field investigations, a six-digit numbering system was devised for the compilation of data in each harvest unit. The watershed number was used for the first three digits and the last three digits were used for the individual unit (unit #331049 is unit 49 within Forest Service Watershed 331). The individual unit was originally numbered from the LSTA. Deletions of units, combination of parts of units to form an entirely new unit, and other modifications necessitated this system. Because of the difficulty in EIS mapping, this six-digit number was changed to a 1 to 3 digit number on the alternative maps to maintain the integrity of the data. Both unit numbers will be referred to in the text but only the 1-3 digit number will be shown on the EIS maps in Chapter 2. For ease of reference, a crosswalk table of the unit numbers is provided at the end of Chapter 2 and Appendix A.

Table 2-4

Port Houghton/Cape Fanshaw Alternative Summary

Item	A	B	C	D	E
Total Net Scribner Volume (MMBF)	0	121.5	116.1	120.7	123.2
Total Area Harvested (Acres)	0	6,037*	5,618*	7,244*	5,471*
Number of Units	0	97	97	120	98
Average Acres/Unit	0	59	54	58	53
Silvicultural Methods (% by acres)					
Clearcut and w/reserves	0	59	68	52	93
Shelterwood w/reserves	0	26	32	21	7
Group selection	0	3	0	15	0
Sanitation salvage	0	12	0	10	0
Overstory removal	0	0	0	2	0
Logging System (% by acres)					
Helicopter	0	20	24	42	24
Running skyline	0	19	29	16	31
Slackline	0	25	33	18	33
Small slackline	0	26	12	17	10
Gravity return	0	8	2	6	1
Shovel	0	1	0	1	0
Highlead	0	less than 1%	less than 1%	less than 1%	less than 1%
Units Between 100-150 Acres	0	2	3	2	6
Number of Units Greater than 150 Acres	0	0	2	0	2
Road Construction (miles)					
Specified roads	0	74.7	94.1	69.4	79.5
Temporary roads	0	14.3	17.2	15.1	15.1

*Includes road right-of-way acreage.

Table 2-5
Comparison of Environmental Consequences

	Alternative				
Item	A	B	C	D	E
Timber					
Species Composition of Harvest Acres (%)					
Western hemlock	0	64	63	63	66
Sitka spruce	0	17	16	16	16
Alaska cedar	0	14	13	14	15
Mountain hemlock	0	5	8	7	3
Marine					
Marine habitat filled (acres)	0	up to 0.5	up to 1.1	up to 0.2	up to 0.2
Bark deposition/dispersion (acres)	0	up to 1	up to 1.2	up to 0.8	up to 0.8
Little Lagoon LTF (MMBF)	0	109	84	109	123
Rabbit Cove LTF (MMBF)	0	8.5	9	0	0
North Point LTF (MMBF)	0	0	10	0	0
Hobart Bay LTF (MMBF)	0	4	13	11	0
TES species effects	none	none	none	none	none
Wildlife Habitats (acres affected)					
Beach fringe	0	17	21	16	16
Scrub	0	3	2	3	<1
Forest Volume Class 3	0	4	4	4	4
Forest Volume Class 4	0	1,789	1,723	2,666	1,618
Forest Volume Class 5	0	2,123	2,036	2,178	2,017
Forest Volume Class 6	0	2,001	1,735	2,200	1,681
Forest Volume Class 7	0	31	3	26	69
Bogs, fens, and peatlands	0	55	69	90	45
Alpine	0	2	0	0	0
Wildlife Carrying Capacities (number of individuals)					
Vancouver Canada goose	276	265	275	264	265
Brown creeper	10,651	10,072	10,052	10,016	10,026
Bald eagle	263	263	263	263	261
Hairy woodpecker	2,236	2,059	2,087	2,042	2,074
River otter	97	97	97	97	97
Martin	371	353	356	350	354
Sitka black-tailed deer	2,467	2,313	2,359	2,309	2,352
Mountain goat	310	304	302	303	303
Red squirrel	106,273	102,283	102,221	101,986	102,216
Red-breasted sapsucker	14,867	14,058	14,031	13,979	13,994
Black bear	278	257	253	258	258
Gray wolf	9	9	9	9	9
Biodiversity					
Number of patches	220	585	597	557	592
Average patch size (acres)	223	80	80	84	80
Maximum patch size (acres)	12,400	5,984	3,912	6,237	6,237

Table 2-5 (continued)

Comparison of Environmental Consequences

Item	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Interior area of old-growth forest (acres)	20,408	15,357	15,188	15,386	15,416
% of old growth in patches > 100 acres	91	83	82	82	81
% of old growth in patches > 1,000 acres	75	66	60	60	64
TES Species					
Goshawk	no changes	known nests follow draft guidelines	known nests follow draft guidelines	known nests follow draft guidelines	known nests follow draft guidelines
Harlequin Duck (candidate)	no changes	potential sedimentation in foraging and loafing areas	potential sedimentation in foraging and loafing areas	potential sedimentation in foraging and loafing areas	potential sedimentation in foraging and loafing areas
Marbled Murrelet (candidate)	no changes	possible loss of nests in areas cut	possible loss of nests in areas cut	possible loss of nests in areas cut	possible loss of nests in areas cut
Fish/Water Quality					
Road construction miles in stream buffers	0	1.8	2.0	1.7	2.0
Number of road crossings over streams					
Class I/II	0	32	34	31	38
Class III	0	56	63	44	54
Total	0	88	97	75	92
Acres within rain-on-snow elevation zone	0	4,660	4,670	4,620	4,630
Class III miles in harvest units and stream miles exposed to direct sun	0	12.2	13.6	12.4	11.9
Percent increases in sediment yield from roads over background conditions	0	18	19	15	27
Area in high potential erosion class soils (acres)	0	2,200	2,090	2,150	2,130
Geology/Minerals/Soils					
Effects on mining claims	none	increased access to Port Houghton stone producer	increased access to Port Houghton stone producer	none	none
Total acres of soil disturbance	none	6,386	6,030	7,553	5,841
% road miles ≥ 60% slopes	0	1	3	1	1
Unit acres on ≥ 70% slopes	0	66	82	73	73
Unit acres in wetlands	0	523	598	516	338
Road acres in wetlands	0	159	191	159	143
Floodplain crossing in acres	0	9	9	8	8
Unit acres in Soil Hazard Class III	0	1,770	1,587	1,699	1,915

Table 2-5 (continued)

Comparison of Environmental Consequences

Item	Alternative A	B	C	D	E
Road acres in Soil Hazard Class III	0	96	119	92	115
Subsistence					
Significant Possibility of a Significant Restriction					
Salmon, finfish, shellfish	no	no	no	no	no
Deer	yes	yes	yes	yes	yes
Waterfowl	no	no	no	no	no
Harbor seals	no	no	no	no	no
Furbearers	no	no	no	no	no
Bear	no	no	no	no	no
Cultural Resources					
Overall risk to cultural resources	none	low	moderate	low	moderate
Resource sites potentially affected	none	none	one	one	one
Recreation—Acres of ROS Class (%)					
Primitive	66,047 (48)	23,565 (17)	20,270 (15)	20,258 (15)	24,115 (18)
Semi-primitive non-motorized	53,613 (39)	56,003 (41)	55,065 (40)	54,714 (40)	57,922 (42)
Semi-primitive motorized	17,163 (13)	22,249 (16)	25,189 (18)	21,184 (15)	17,810 (13)
Roaded modified	0 (0)	35,005 (26)	36,299 (27)	40,666 (30)	36,977 (27)
Visual Resources					
Visual effects by viewshed					
Farragut Bay	no change	no change	no change	no change	no change
North Arm	no change	harvest visible, natural appearance dominates, VQO: M, MM met*	harvest visible, disturbances resemble natural patterns, VQO: M, MM met*	harvest visible, natural appearance dominates, VQO: M, MM met*	harvest visible, disturbances resemble natural patterns, VQO: M, MM met*
Frederick Sound	no change	no change	no change	no change	no change
Whitney Island	no change	harvest visible, barely discernable, VQO: R, PR, M met*	harvest visible, barely discernable, VQO: R, PR, M met*	harvest visible, barely discernable, VQO: R, PR, M met*	harvest visible, barely discernable, VQO: R, PR, M met*
Mouth of Port Houghton	no change	harvest visible, no significant change from existing condition, VQO: PR, M met*	harvest visible, no significant change from existing condition, VQO: PR, M met*	harvest visible, no significant change from existing condition, VQO: PR, M met*	harvest visible, no significant change from existing condition, VQO: PR, M met*

Table 2-5 (continued)

Comparison of Environmental Consequences

Item	Alternative A	B	C	D	E
Port Houghton	no change	harvest visible, disturbances resemble natural patterns, VQO: PR not met, M met*	harvest visible, disturbances resemble natural patterns, VQO: PR not met*	harvest visible, disturbances resemble natural patterns, VQO: PR not met, M met*	harvest visible, disturbances resemble natural patterns, VQO: M met*
Sandborn Canal	no change	no change	no change	no change	harvest visible, disturbances resemble natural patterns, VQO: M met*
Inner Port Houghton	no change	harvest strongly apparent; does not meet VQO of PR*	harvest strongly apparent; does not meet VQO of PR*	harvest visible, natural appearance dominates, VQO: M, met*	no change
Salt Chuck Antechamber	no change	no change	harvest strongly apparent, does not meet VQO of PR*	harvest visible, natural appearance dominates, VQO: M, PR met*	no change
Salt Chuck	no change	no change	no change	no change	no change
Economics					
Estimated current net stumpage value ($/MBF)	0	63.60	47.61	10.45	119.93
Number of jobs generated	0	1,045	999	1,038	1,059
Regional income generated ($ million)	0	29.0	27.7	28.8	29.4
Income contribution to GSP ($ million)	0	96.7	90.7	96.2	98.8

*VQO is visual quality objectives with PR = Partial Retention, M = Modification, MM = Maximum Modification, R = Retention.

Legend (by Unit No.) for Unit Numbering Scheme for Figures 2-1, 2-2, 2-3, and 2-4

Actual Unit #	Map #	Alternative
Salvage Area	261	B, D
Salvage Area	271	B, D
Salvage Area	291	B, D
Group Sel. Area	321	D
Group Sel. Area	322	D
Group Sel. Area	332	D
Group Sel. Area	398	C, D
26102	159	B, C, E
26103	164	B, C, D, E
27102	151	B, C, D, E
27103	158	D
27105	153	B, C, D, E
27107	160	B, C, D, E
27108	163	B, C, D, E
27109	169	B, C, D, E
27110	170	B, C, D, E
27113	164	B, D, E
29101	125	B, C, D, E
29102	137	B, C, D, E
29103	142	B, C, D, E
29104	146	B, C, D, E
29105	144	B, C, D, E
29106	131	B, C, D, E
29107	124	B, C, D, E
29111	134	B, D, E
29112	155	B, D, E
29113	167	B, D, E
29114	154	D
29115	150	D
29117	161	B, C, D
29119	168	B, C, D
29120	171	B, C, D
29121	172	B, D, E
29122	173	B, D
29123	174	B, D
29125	156	C, E
29126	145	C, E
29127	166	C, E
29130	177	C, D
29198	118	B, C, D, E
33301	132	B, C, D, E
311140	1	C
311141	14	C
311142	4	C
311144	6	C, D
311145	12	C, D
311146	8	C, D
311147	17	C
311199	15	D
312143E	11	D
312143W	10	D
321002	40	D
321003	39	D
321004	45	D
321006	54	C
321007	59	C
321008	53	B
321009E	61	B, C
321009W	56	B, D
321010	65	C, D
321011	70	C, D
321012	73	B, C, D
321013	72	B, C
321014	77	C
321015	85	C
321016	78	C
321017	88	B, C, D
321018	104	B, C, D
321019	95	C
321020	176	C
321021	100	C
321022	109	C
321023	115	B, C
321024	128	B, C, D, E
321025	121	B, C, D, E
321026	141	B, C, D, E
321027	140	B, C, D, E
321028	147	B, C, D, E
321029	148	B, C, D, E
321030	157	B, C, D, E
321197	116	B, D
321199	106	B, C, D
322031	55	C, D
322032	67	B, C
322033	79	B, C
322034	81	B, C, D
322035	83	B, E
322036	96	B, D, E
322037	94	B, C, D, E
322039	93	B, C, D
322040	110	B, C, D, E
322041	108	B, C, D, E
322042	120	B, D, E
322043	127	B, D
322044	133	B, D, E
331045	62	B, D
331046	82	B, D, E
331047	86	B, D, E
331048	92	B, D, E
331049	112	B
331187	113	B, D
331188	105	B, D, E
332050	33	B, C, D, E
332051	35	D
332052	41	D
332053	37	D, E
332054	36	D, E
332055	51	D, E
332056	46	E
332057	64	E
332058	49	D, E
332059	52	B, D, E
332060	43	D, E
332061	47	D, E
332063	44	D
332064	38	D
332065	175	B, C, E
332066	50	E
332067	57	B, D
332068	69	B, D, E
332069	60	B, C, D
332070	66	B, C, E
332071	74	B, C, D, E
332072	75	B, C, D, E
332073	87	B, C, E
332074	99	B, C, E
332075	102	D
332076	107	D
333077	34	E
333078	42	E
333079	48	E
333081	63	B, C, D, E
333082	71	B, C, D
333083	76	B, C, D, E
333084	90	B, D, E
333085	91	B, C, D, E
333086	111	B, C, D, E
333087	89	B, D, E
333088	97	B, D, E
333089	80	E
333090	84	E
333093	117	B, C, D, E
341094	58	E
341095	68	E
341097	98	E
341098	101	E
341099	114	E
341101	123	D
341102	138	B, C, D, E
341103	135	E
341104	143	C, D, E
341105	129	E
341107	139	E
341109	149	E
341110	162	E
341111	152	E
341112	136	E
341113	130	E
341114S	126	E
341114	119	E
341115	103	E
341116	122	E
341118	30	B, C
381131	2	D
381133	3	B, C
381135	9	B, C
381136	7	D
381137	13	B, C, D
381138	16	D
381139	19	B, C, D
381140	18	B, C
381199	5	D
398119	24	B, C
398120	26	B, C, D
398121	28	B, C, D
398122	31	B, C
398123	25	B, C, D
398124	32	C
398125	27	C
398126	21	C, D
398128	23	C
398129	29	C
398130	22	D

Legend (by Map No.) for Unit Numbering Scheme for Figures 2-1, 2-2, 2-3, and 2-4

Map #	Actual Unit #	Alternative	Map #	Actual Unit #	Alternative	Map #	Actual Unit #	Alternative
1	311140	C	71	333082	B, C, D	140	321027	B, C, D, E
2	381131	D	72	321013	B, C	141	321026	B, C, D, E
3	381133	B, C	73	321012	B, C, D	142	29103	B, C, D, E
4	311142	C	74	332071	B, C, D, E	143	341104	C, D, E
5	381199	D	75	332072	B, C, D, E	144	29105	B, C, D, E
6	311144	C, D	76	333083	B, C, D, E	145	29126	C, E
7	381136	D	77	321014	C	146	29104	B, C, D, E
8	311146	C, D	78	321016	C	147	321028	B, C, D, E
9	381135	B, C	79	322033	B, C	148	321029	B, C, D, E
10	312143W	D	80	333089	E	149	341109	E
11	312143E	D	81	322034	B, C, D	150	29115	D
12	311145	C, D	82	331046	B, D, E	151	27102	B, C, D, E
13	381137	B, C, D	83	322035	B, E	152	341111	E
14	311141	C	84	333090	E	153	27105	B, C, D, E
15	311199	D	85	321015	C	154	29114	D
16	381138	D	86	331047	B, D, E	155	29112	B, D, E
17	311147	C	87	332073	B, C, E	156	29125	C, E
18	381140	B, C	88	321017	B, C, D	157	321030	B, C, D, E
19	381139	B, C, D	89	333087	B, D, E	158	27103	D
21	398126	C, D	90	333084	B, D, E	159	26102	B, C, E
22	398130	D	91	333085	B, C, D, E	160	27107	B, C, D, E
23	398128	C	92	331048	B, D, E	161	29117	B, C, D
24	398119	B, C	93	322039	B, C, D	162	341110	E
25	398123	B, C, D	94	322037	B, C, D, E	163	27108	B, C, D, E
26	398120	B, C, D	95	321019	C	164	26103	B, C, D, E
27	398125	C	96	322036	B, D, E	164	27113	B, D, E
28	398121	B, C, D	97	333088	B, D, E	166	29127	C, E
29	398129	C	98	341097	E	167	29113	B, D, E
30	341118	B, C	99	332074	B, C, E	168	29119	B, C, D
31	398122	B, C	100	321021	C	169	27109	B, C, D, E
32	398124	C	101	341098	E	170	27110	B, C, D, E
33	332050	B, C, D, E	102	332075	D	171	29120	B, C, D
34	333077	E	103	341115	E	172	29121	B, D, E
35	332051	D	104	321018	B, C, D	173	29122	B, D
36	332054	D, E	105	331188	B, D, E	174	29123	B, D
37	332053	D, E	106	321199	B, C, D	175	332065	B, C, E
38	332064	D	107	332076	D	176	321020	C
39	321003	D	108	322041	B, C, D, E	177	29130	C, D
40	321002	D	109	321022	C	261	Salvage Area	B, D
41	332052	D	110	322040	B, C, D, E	271	Salvage Area	B, D
42	333078	E	111	333086	B, C, D, E	291	Salvage Area	B, D
43	332060	D, E	112	331049	B	321	Group Sel. Area	D
44	332063	D	113	331187	B, D	322	Group Sel. Area	D
45	321004	D	114	341099	E	332	Group Sel. Area	D
46	332056	E	115	321023	B, C	398	Group Sel. Area	C, D
47	332061	D, E	116	321197	B, D			
48	333079	E	117	333093	B, C, D, E			
49	332058	D, E	118	29198	B, C, D, E			
50	332066	E	119	341114	E			
51	332055	D, E	120	322042	B, D, E			
52	332059	B, D, E	121	321025	B, C, D, E			
53	321008	B	122	341116	E			
54	321006	C	123	341101	D			
55	322031	C, D	124	29107	B, C, D, E			
56	321009W	B, D	125	29101	B, C, D, E			
57	332067	B, D	126	341114S	E			
58	341094	E	127	322043	B, D			
59	321007	C	128	321024	B, C, D, E			
60	332069	B, C, D	129	341105	E			
61	321009E	B, C	130	341113	E			
62	331045	B, D	131	29106	B, C, D, E			
63	333081	B, C, D, E	132	33301	B, C, D, E			
64	332057	E	133	322044	B, D, E			
65	321010	C, D	134	29111	B, D, E			
66	332070	B, C, E	135	341103	E			
67	322032	B, C	136	341112	E			
68	341095	E	137	29102	B, C, D, E			
69	332068	B, D, E	138	341102	B, C, D, E			
70	321011	C, D	139	341107	E			

Chapter 3

Affected Environment

Chapter 3

Affected Environment

This chapter provides information about the existing environment of the Port Houghton/Cape Fanshaw project area that may be affected by implementing any of the alternatives described in Chapter 2. Discussions include aspects of the physical, biological, cultural, economic, and social environments that may be affected. This information is used in Chapter 4 to evaluate the effects of changes in the environment under the various project alternatives for the proposed timber harvest. The Port Houghton/Cape Fanshaw project area is designated by management decisions made in the TLMP, as amended, to be managed for resource use and development (e.g., timber harvest) and for other amenities. Resource use and development will necessarily alter the environment for both the short term and the long term.

The Port Houghton/Cape Fanshaw project area contains a total of 143,667 acres encompassing six VCUs on the Chatham Area of the Tongass National Forest (VCUs 79-84), and five VCUs on the Stikine Area (VCUs 85-89). Of this total land area, 3,843 acres are owned by Goldbelt, Inc. (a Native corporation) 2,919 acres are owned by the State of Alaska, and 587 acres of National Forest lands are classified Imposed Use Restriction Area (Figure 1-2). These latter acres, which represent the Cape Fanshaw Natural Area, are administratively unavailable and restricted from consideration for harvest activities.

Most of the 3,842 acres of land within the project area that are owned by Goldbelt, Inc. have been logged or are expected to be logged by 1997. The land exchanges between Goldbelt, Inc. and the Forest Service, beginning in 1979, have involved both subsurface and surface conveyance, and rock and road easements. The most recent land exchange occurred in April 1994, when 2,595 acres were conveyed to Goldbelt, Inc. by the Forest Service. Of these, 780 acres are within the project area. The EIS analysis, when considering project effects to natural resources, considers all Goldbelt, Inc. land in the project area as clearcut habitat for existing conditions.

Lands managed by the Forest Service in the project area total 136,906 acres; of these, 48,044 acres within the Stikine Area managed by the Petersburg Ranger District, and 88,862 acres are within the Chatham Area managed by the Juneau Ranger District.

The project area is composed largely of saltwater shorelines, steep forested terrain, mountain tops, and broad river valleys. Some valleys end in estuaries such as Sandborn Canal. Other valleys are V-notch drainages, some with scenic

waterfalls. A LUD II area (northeast portion of VCU 79) established by the TTRA bounds the eastern periphery of the project area surrounding the Port Houghton Salt Chuck. Several islands occur offshore of the project area. These islands vary in size from a small vertical outcrop of rocks with a mature stand of trees (such as the Haystack) to large forested islands (such as Whitney Island).

Timber (Issues 1 and 2)

The net total land area of 136,317 acres available for timber management contains 16,805 acres of non-forest land (12 percent) and 33,819 acres of low-productivity non-commercial forest land (24 percent) (Table 3-1). To be considered commercial forest land, an area must be capable of producing 20 cubic feet of timber per acre per year or have a timber site index of 40 (base 50 years) or more.

Table 3-1
Port Houghton/Cape Fanshaw Project Area Acres by Land Class and VCU*

VCU	Non-Forest Land	Non-Commercial Forest Land	Commercial Forest Land	Total Acres	% Area
Chatham Area					
79	8,418	8,368	24,025	40,811	46
80	718	1,847	3,393	5,958	7
81	8	677	1,814	2,499	3
82	335	1,715	9,378	11,428	13
83	707	2,405	7,682	10,795	12
84	4,282	3,280	9,814	17,377	20
Subtotal	**14,469**	**18,294**	**56,105**	**88,868**	**100**
% Area	16	21	63	100	
Stikine Area					
85	95	1,244	2,846	4,185	9
86	266	3,694	4,523	8,484	18
87	831	4,705	8,845	14,382	30
88	20	894	2,591	3,505	7
89	1,124	4,986	10,783	16,893	36
Subtotal	**2,336**	**15,525**	**29,588**	**47,449**	**100**
% Area	5	33	62	100	
TOTAL PROJECT AREA					
TOTAL	**16,805**	**33,819**	**85,693**	**136,317**	**100**
% Area	12	25	63	100	

*Includes only those lands available for timber management.
Source: Jenkins 1995a

The resulting net productive commercial forest land area, 85,693 acres, is classified into seven discrete volume classes, each representing a range of timber volumes per acre (Table 3-2). There are 96 acres within volume class 3 which are young second-growth stands of non-merchantable size averaging less than 8 MBF per acre. Volume classes 4 through 7 contain trees of merchantable size with more than 8 MBF per acre.

Table 3-2

Range of Timber Volumes per Acre by Volume Class

Volume Class	Volume (MBF/Acre)
3	0 - 8
4	8 - 20
5	20 - 30
6	30 - 50
7	50+

Source: USDA-FS 1979a

The 85,693 acres of forest land area within volume classes 3 through 7 contain 8,886 acres that are unsuitable for harvest activities due to soil and slope stability hazards, and 8,976 acres that are unsuitable due to TTRA buffers around sensitive hydrological features such as lakes, rivers, marine shoreline, eagle nests, and estuaries. Subtracting the 96 acres of suitable forest land within volume class 3 (which is considered non-merchantable) results in 67,735 acres of suitable forest land available for timber harvest activities (Table 3-3). Approximately 63 percent of the total occurs in the Chatham Area, and 37 percent occurs in the Stikine Area. Proportionally more unsuitable land occurs in the Chatham portion of the project area, primarily due to greater amounts of unstable soils in mountainous areas; unstable soils are not as extensive in the Stikine portion of the project area.

Table 3-3

Adjustments to CFL in the Determination of Suitable Available CFL

	CFL Not Suitable For Harvest				Total Forest Land				
VCU	TTRA Buffers	Estuary Buffers	Soil Stability Hazard	Eagle Nest Buffers	Unsuitable	Commercial	Suitable	Non-Merch Volume Class 3	Total Suitable Available
Chatham Area									
79	1,586	784	3,253	41	5,665	24,025	18,360	9	18,351
80	140	-	707	10	857	3,393	2,537	80	2,457
81	11	-	387	-	398	1,814	1,416	-	1,416
82	718	69	808	4	1,598	9,378	7,779	-	7,779
83	726	267	459	36	1,489	7,682	6,193	4	6,189
84	712	817	1,976	10	3,514	9,814	6,299	3	6,296
Subtotal	**3,894**	**1,937**	**7,590**	**101**	**13,521**	**56,105**	**42,584**	**96**	**42,488**
% Total	62	79	85	46	76	65	63	100	63
Stikine Area									
85	208	22	206	44	481	2,846	2,366	-	2,366
86	415	75	10	7	508	4,523	4,016	-	4,016
87	688	59	667	2	1,415	8,845	7,430	-	7,430
88	169	47	197	13	426	2,591	2,165	-	2,165
89	940	305	216	51	1,513	10,783	9,270	-	9,270
Subtotal	**2,420**	**509**	**1,297**	**117**	**4,342**	**29,588**	**25,247**	-	**25,247**
% Total	38	21	15	54	24	35	37	0	37
TOTALS	**6,313**	**2,446**	**8,886**	**217**	**17,862**	**85,693**	**67,831**	**96**	**67,735**

Source: Jenkins 1995a

Timber Volume

Acres By Volume Class

The silvicultural walk-through stand examinations in the summer of 1994 were conducted on all proposed harvest units. The field observations and measurements were used to refine the GIS map to more accurately calculate the area of timber stand types. The 67,735 acres of suitable and available land area are summarized by VCU and volume class in Table 3-4. The Chatham portion of the project area has proportionally more acres of volume class 6 than the Stikine portion of the project area, which is primarily comprised of volume classes 4 and 5.

Table 3-4
Suitable Available CFL Acres by Volume Class and VCU.

VCU	Acres by Volume Class				Total Acres	% Area
	4	5	6	7		
Chatham Area						
79	6,283	3,872	8,196	-	18,351	43
80	1,035	1,108	289	25	2,456	6
81	805	446	165	-	1,416	3
82	2,359	2,558	2,734	128	7,779	18
83	2,371	2,325	1,494	-	6,189	15
84	2,362	1,192	2,484	258	6,297	15
Subtotal	**15,215**	**11,501**	**15,362**	**411**	**42,488**	**100**
% Area	36	27	36	1	100	
Stikine Area						
85	963	793	594	15	2,366	9
86	2,272	1,369	354	21	4,016	16
87	3,589	2,724	1,118	-	7,431	29
88	1,024	956	186	-	2,165	9
89	4,887	3,408	973	2	9,270	37
Subtotal	**12,734**	**9,250**	**3,225**	**38**	**25,247**	**100**
% Area	50	37	13	0	100	
TOTAL	**27,949**	**20,751**	**18,587**	**449**	**67,736**	**100**
% Total	41	31	27	1	100	

Source: Jenkins 1995a

Volume Calculations

Net sawlog volumes were calculated on a 40-foot (long-log) basis from data collected using variable plots for the volume classes encountered in the walk-through exam for each unit. The estimated total volume on the suitable and available timber land is 1,417,570 MBF.

The resulting volume strata averages by VCU are applied to the respective suitable and available acres by volume class for the whole project area. The result is a field-measured total net scribner sawlog inventory volume estimate of 1,417,570 MBF which is summarized by volume class and VCU in Table 3-5. Most timber

Table 3-5

Net Volume (MBF) by Volume Class and VCU

VCU	Net MBF by Volume Class and VCU 4	5	6	7	Total MBF	% Area
Chatham Area						
79	61,269	76,826	261,857		399,952	43
80	11,830	23,435	8,267	1,366	44,898	5
81	9,202	8,430	4,738		23,370	2
82	27,616	61,180	93,460	6,233	188,489	20
83	26,742	54,421	50,226		131,389	14
84	28,899	25,210	84,535	13,118	151,762	16
Subtotal	**165,558**	**250,502**	**503,083**	**20,717**	**939,860**	**100**
% Area	18	27	54	2	100	
% Total	50	55	82	91	66	
Stikine Area						
85	12,436	17,322	20,119	843	50,720	11
86	29,349	29,886	11,989	1,145	72,369	15
87	46,365	59,462	37,841		143,668	30
88	13,224	20,860	6,282		40,366	8
89	63,136	74,412	32,923	116	170,587	36
Subtotal	**164,510**	**201,942**	**109,154**	**2,104**	**477,710**	**100**
% Area	34	42	23	0	100	
% Total	50	45	18	9	34	
Total Project Area						
TOTAL	**330,068**	**452,444**	**612,237**	**22,821**	**1,417,570**	**100**
% Total	23	32	43	2	100	

Volumes are net MBF/acre, not including utility; 40' log basis.
[1]VCUs 80 - 81, and 85 - 89 were combined, respectively, and averaged.
Source: Jenkins 1995a

is in volume class 6 (43 percent); volume classes 4 and 5 comprise 55 percent of the existing net volume. The remaining 2 percent is in volume class 7.

Timber Species Distribution

Timber in the project area is comprised of western hemlock (*Tsuga heterophylla*) (64 percent), Sitka spruce (*Picea sitchensis*) (15 percent), Alaska yellow cedar (*Chamaecyparis nootkatensis*) (14 percent), mountain hemlock (*Tsuga mertensiana*) (6 percent), and other non-commercial species, including shore pine (*Pinus contorta*) and red alder (*Alnus rubra*) (<1 percent). Western hemlock is proportionate by volume class, whereas most Sitka spruce occurs in volume class 7. By comparison, Alaska yellow cedar mostly occurs in volume class 4, composing 50 percent of the Stikine Area volume class 4 species mix.

Timber Size and Age Distribution

There are four timber size classes based on tree size and age. These size classes are part of the timber type designation used in the GIS layer named TIMTYP (Table 3-6).

Table 3-6

Timber Stand Size Class Description

Symbol	Stand Size Class	Description
1	Seedling and Sapling	0" to 4.9" dbh
2	Pole Timber	5" to 8.9" dbh
3	Young-Growth Sawtimber	9" + dbh & < 150 years old
4	Old-Growth Sawtimber	9" + dbh & ≥ 150 years old

Source: Jenkins 1995a

Most of the land in the Port Houghton/Cape Fanshaw project area (outside of land owned by Goldbelt, Inc.) has not been previously harvested or disturbed. Some scattered harvest of timber occurred more than 50 years ago on areas totaling less than 200 acres. Overall, forests in the project area are mature and over-mature climax plant communities and are considered old-growth forests. The distribution of stand size classes by VCU is given in Table 3-7. Over 99 percent of the project area is of stand size class 4; stand size classes 1 and 2 do not occur.

Table 3-7

Acres of Timber Stand Size Class by VCU

	Stand Size Class				
VCU	1	2	3	4	Total Acres
Chatham Area					
79	-	-	18	18,334	18,352
80	-	-	8	2,448	2,456
81	-	-	-	1,416	1,416
82	-	-	156	7,623	7,779
83	-	-	-	6,189	6,189
84	-	-	5	6,291	6,296
Subtotal	**-**	**-**	**187**	**42,301**	**42,488**
Stikine Area					
85	-	-	90	2,276	2,366
86	-	-	-	4,016	4,016
87	-	-	-	7,430	7,430
88	-	-	-	2,165	2,165
89	-	-	-	9,270	9,270
Subtotal	**-**	**-**	**90**	**25,157**	**25,247**
Total Project Area					
TOTALS	-	-	277	67,458	67,735

Source: Jenkins 1995a

Forest Condition

The following paragraphs describe the agents of greatest concern observed during field investigations.

Hemlock dwarf mistletoe is present throughout the Port Houghton/Cape Fanshaw project area. This parasitic plant reduces the vigor and growth rate of western hemlock. Infection rates are variable for individual stands. The most heavily infected areas near the unit and road pool occur along the Sandborn Canal, and southward, higher into the Sandborn River watershed. Twenty-seven percent of all sampled stands have significantly high concentrations of mistletoe infection.

Alaska yellow cedar decline was observed to some degree wherever Alaska yellow cedar occurs in the project area. It is most noticeable throughout the Stikine Area and on the lower (toe) portions of slopes in the Chatham Area. The cause of Alaska yellow cedar decline is associated with poorly drained soils (Hennon et al. 1990). Seven percent of sample stands have significant levels of decline.

General decay, including stem and root decay, is probably the single greatest cause of disease-related timber volume loss in the project area. It is estimated to be as high as 25 percent of the gross volume. Mountain and western hemlock are more susceptible to decay than other species in the project area. The level of decay occurs at a relatively higher proportion for stands in VCUs 79, 80, and 81, where the species composition has a higher proportion of mountain hemlock. In addition, porcupine damage to hemlock trees, with resulting decay, was noted throughout the project area.

Windthrow occurs as groups of trees or individual trees are uprooted by the force of high winds. It is estimated that 22 percent of sampled stands are in high risk of windthrow.

Site Productivity

Knowledge of productivity is important in predicting future yields and to assist forest managers in setting silvicultural priorities. The Site Index is used as an indicator of the productivity of a particular forest site. The Site Index is based on the relationship of the measured height and age of dominant trees in the stand. Site tree measurements were collected in each volume class strata by VCU. Volume class 7 averages the highest Site Index, followed in order by volume classes 6, 5, and 4.

Past Harvesting

Within the project area, the earliest record of commercial logging activity dates to 1948 when about 300 MBF of Sitka spruce was logged from 162 acres at Horton Point near Cape Fanshaw. A small 7-acre patch at Steamboat Bay was logged in 1951, and other small patches (under 20-acre size) were logged in 1952 at Russian Cove and along the shoreline of Port Houghton. Harvest began on the Goldbelt, Inc. lands in the 1980's and is expected that all commercial forest will be harvested by 1997.

Marine (Issue 3)

Eleven potential candidate LTF sites were initially reviewed based on previous surveys conducted by the USFWS in 1980 and 1981 for a previously proposed timber harvest in Port Houghton (USFWS 1980, 1981). The results of the historical surveys were used to select two potential LTF sites for that timber harvest, and complete an environmental assessment (USDA-FS 1983a). Information from the environmental assessment and results of the USFWS marine investigations were used as baseline data to initially assess the biological and operational characteristics of previous proposed LTFs for potential use for the Port Houghton/Cape Fanshaw LTF facilities, and eliminate some areas from further evaluation.

Two sites by Robert Islands, previously recommended as potential LTF sites by the USFWS, were eliminated because they are within a designated marine park. Three additional potential LTF sites in Port Houghton were eliminated from further consideration because they are in locations previously identified as supporting sensitive and/or commercial marine fauna and flora. One site in Fanshaw Bay was eliminated due to the lack of timber resources within economic proximity to the site. Additional candidate sites were considered using aerial photographs and searching for locations affording shelter, sufficiently deep water, and likely egress from an upland transportation system. As the transportation plan developed for the area, and with further biological scrutiny and field surveys conducted in summer 1994, the pool of LTF sites was narrowed to three potential sites in Port Houghton.

The ATTF siting guidelines and a description of how each site fulfills the recommendations of these guidelines are provided in Appendix C.

Little Lagoon LTF

Physical and Biological Characteristics

The proposed Little Lagoon LTF site is located on the shore of Little Lagoon, some 2.3 miles northwest of the western shore of Sandborn Canal, on a rock promontory between two unnamed streams. Other potential locations for this LTF lie within ¼ mile east or west of this site. Shoreline vegetation is within 30 ft of the high tide level and is comprised of an overstory of western hemlock and an understory of five-leaved bramble (*Rubus pedatus*), rusty menziesii (*Menziesia ferruginea*), bunchberry (*Cornus canadenis*), blueberry (*Vaccinium ovalifolium*), Sitka spruce, and western hemlock. Alder is interspersed between the shoreline and forested vegetation.

A relatively flat, sand delta at the mouth of a Class I fish-bearing stream occurs east of the proposed site. Offshore from this LTF site, two subsurface rock pinnacles (Little Rock and Big Rock) are exposed, or nearly exposed, at extreme low tides. The far eastern portion of the Little Lagoon LTF site consists of a relatively flat sand bench that grades into a steep boulder and bedrock promontory to the west. With the exception of the sandflat area at the far eastern end of the LTF site, the intertidal portion of the Little Lagoon LTF is quite steep and composed of bedrock and large- to medium-sized boulders. The beach slope is approximately 22 percent, and it continues into the subtidal area where the substrate changes from bedrock and boulders, to cobble, gravel, sand, mud, and shell debris.

The marine organisms identified at this LTF site are typical of patterns of zonation observed along the northern Pacific coast (Kozloff 1973). Fauna typical of the lower intertidal zones include sea cucumbers and seastars (*Leptasterias hexactis, Evasterias troschelii, Pisaster ochraceus*) that occur below +4 ft MLLW.

Hardshell clams (*Macoma secta, M. nasuta, Tresus nuttalli, T. capax, Clinocardium nuttalli*) and serpulid polychaete worm tubes are the dominant subtidal fauna along the eastern portion of this LTF site. Brown kelps (*Laminaria saccharina, L. groenlandica*), which are the dominant macroalgae from 0 to -60 ft MLLW, are attached to bedrock and boulder. Univalves, attached to boulders and bedrock, and hermit crabs (*Pagurus* spp.), found in the crevices and on the faces of boulders, are the dominant fauna in the central and western portion of the LTF site.

One historical bald eagle (*Haliaectus leucocephalus*) nest site is located within 330 ft of the proposed LTF site, as reported by the USFWS in 1989. The nest has not been used at least since 1981, and is no longer present. Distinct river otter (*Lutra canadensis*) runways and burrows also occur near the LTF site. Other wildlife species observed near the site include the red squirrel (*Tamiasciurus hudsonicus*) and various songbirds.

Marine Fisheries Resources

<u>Pacific Herring</u> - The presence of Pacific herring (*Clupea harengus pallasi*) in the project area has been documented by ADF&G as early as the 1970s. Over the next 20 years, aerial surveys by ADF&G for Pacific herring spawn in the project area were sporadic and on an opportunistic basis (ADF&G 1994a). In the late 1980s and 1990s, more systematic surveys were conducted. Although there are probably many locations in the project area where herring have spawned over the last 20 years, locations of known herring spawn areas recorded by ADF&G occur along the shoreline from Point Hobart to north of Walter Island. Other documented winter Pacific herring spawn areas (USDA-FS 1983a; ADF&G 1994a) near the Little Lagoon LTF site occur along the southern shore of Port

Houghton at the proposed Little Lagoon LTF site; about 1 mile east of the Little Lagoon LTF site, about 2.5 miles east of the Little Lagoon LTF site, about 1.5 miles west of the Little Lagoon LTF site, and about 0.5 miles west of the mouth of Sandborn Canal (see Appendix K). First and last seasonal dates of observed spawning from 1985 to 1994 indicate that spawning occurs between mid-April and early May with peak spawning in late April and early May. Approximately 44.5 nautical miles of herring spawn have been documented in the Port Houghton and Hobart Bay areas.

Only commercial operations for food and bait Pacific herring fisheries are permitted in Port Houghton, and these fisheries have been limited (ADF&G 1994a). Fishing is allowed when the spawning stock exceeds the minimum threshold level of 2,000 tons in Port Houghton. The fishery was open in January and February from 1991 to mid 1993. The fishery reopened from October 1993 and remained open through February 1994. The 1994-1995 fishery opened in October 1994, and was still open as of August 1995. The largest herring stock in southeastern Alaska (Sitka) has a minimum threshold level of 7,500 tons. Survival rates vary among herring stocks, and the inside waters of Southeast Alaska (where Port Houghton is located) have lower survival rates than outer coastal spawning locations, such as Sitka. Most of the herring in the Port Houghton project area mature and begin to spawn at around 4 years of age. The fishery in Port Houghton is presently supported by fish that are approximately 7 years old, and the stock has been slightly over the threshold level for the last 4 years. Humpback whales that regularly occur in Port Houghton during the summer months are believed to feed primarily on the herring present.

Other Finfish - The USFWS completed one trawl with a 12-ft otter trawl at the northern end of Sandborn Canal in May 1981 to document finfish present in the Port Houghton project area (USFWS 1981). Catch results indicate that coon stripe shrimp, starry flounder (*Platichthys stellatus*), yellowfin sole (*Limanda aspera*), lyre crab (*Hyas lyratus*), and brachiopods are dominant.

Comments received from the public during the scoping meetings indicate that some halibut fishing occurs at the Rusty River in the Salt Chuck, near the Lighthouse Reserve, throughout Port Houghton, and near the entrance to Sandborn Canal. Additional information from the public indicates that herring seiners, halibut (*Hippoglossus stenoleps*), and Pacific cod (*Gadus macrocephalus*) longliners use marine waters adjacent to the proposed Port Houghton/Cape Fanshaw project area.

Shellfish and Other Invertebrates - Shrimp pot sets have been documented by ADF&G along the northern shore of Port Houghton approximately 2 miles northeast of Walter Island (ADF&G, personal communication 1994). The USFWS set commercial shrimp pots in deep water (60 to 70 fathoms) along the north shore of Port Houghton in 1981, as part of their survey of potential LTF

sites (USFWS 1981). Snail (*Colus jordani*) and spot shrimp (*Pandalus platyceros*) dominated the catch.

Commercial and recreational crab pot sets were observed by the Port Houghton field crew during summer 1994, and others were seen within Sandborn Canal and west of the proposed Little Lagoon LTF. The USFWS set four dungeness crab pots and one tanner crab (*Chionoecetes tanneri*) pot near the central portion of Sandborn Canal (USFWS 1981). Tanner crab was the most abundant species captured; while king crab (*Paralithodes camtschatica*), dungeness crab, and starry flounder were also present.

Written comments from individuals and agencies provide additional information on commercial shellfish resources in the project area. A large commercially unharvested scallop (*Chlamys* spp.) bed occurs in Sandborn Canal along with other species, such as sea urchins (*Strongylocentrotus* spp.) and sea cucumbers (*Stichopus californicusss, Cucumaria* spp.). This bed could be harvested as new fisheries develop in Southeast Alaska. Shrimpers, and dungeness and king crabbers use the marine waters adjacent to the proposed Port Houghton/Cape Fanshaw project area from Storm Island to Point Roberts. In addition, crabbers use Fanshaw Bay, an area north of Whitney Island to Roberts Island, Sandborn Canal, and North Arm. In recent years, commercial crab fishing has extended into the Salt Chuck.

North Point LTF

Physical and Biological Characteristics

The proposed North Point LTF is located on the south shore of Port Houghton approximately 4 miles northeast of the eastern shore of Sandborn Canal. The vegetation near the site is comprised of a western hemlock overstory and an understory of blueberry, five-leaved bramble, bunchberry, rusty menziesii, and oak fern (*Gymnocarpium dryopteris*). The LTF site is located on an exposed, almost vertical, bedrock knob in the intertidal zone, and near a ridge of rock paralleling the beach line behind the knob. A rock ridge separates the major hillside landform on its backside by an 80- to 100-ft-wide marsh which slopes into a tidewater inlet about 200 ft northwest of the proposed site. The marsh consists of a dense *Fucus gardneri* bed in the lower intertidal elevations and grades into a predominantly sedge (*Carex* spp.) marsh in the higher elevations. No identified streams enter the tidewater inlet. A narrow beach of about 12 percent slope, which occurs which between the knob and the ridge, is exposed to the northwest.

The distribution of intertidal flora and fauna is similar to that observed at the Little Lagoon LTF site and is consistent with USFWS findings during a survey at this site in 1981. No unique flora and fauna were observed at this site during 1994 field surveys. The slope of the shallow subtidal area is steep, and kelp occur in a compacted zone from 0 to -30 ft MLLW. During summer 1994,

Laminaria groenlandica was the most abundant kelp species, and no macroalgae were observed seaward of about -30 ft MLLW. Worm tubes, sea stars, and sea cucumbers inhabit portions of the subtidal transects dominated by sand substrates.

During 1994 field surveys, a male Steller sea lion (*Eumetopias jubata*) was seen just offshore from the LTF site. Several species of songbirds were observed at the site along with red squirrels and river otter scat, running paths, and burrows. A bald eagle nest occurs about 500 ft north of the proposed LTF site.

Marine Fisheries

A documented winter Pacific herring spawn area occurs east of the North Point LTF site along the southern shore of North Arm and east of Bay Point into the North Arm of Farragut Bay (see Appendix K).

Rabbit Cove LTF

Physical and Biological Characteristics

The proposed Rabbit Cove LTF site is located on the south shore of Port Houghton less than 1 mile east of the eastern shore of Sandborn Canal. Vegetation along the shoreline includes of western hemlock with scattered Sitka spruce. The understory vegetation is comprised of devil's club (*Oplopanax horridum*), five-leaved bramble, bunchberry, clasping twisted-stalk (*Streptopus amplexifolius*), blueberry, skunk cabbage (*Lysichitum americanum*), and rusty menziesii. The site has an exposed bedrock outcrop with a shallow crescent-shaped beach east of the outcrop and west of a rock cliff. The beach slopes at about 12 percent up to the tree line and about 16 percent up to a +46-ft elevation bench. A rock reef extends into the water from the side of the beach adjacent to the cliff face and is exposed at lower tides. The reef parallels the side of the rock outcrop, with approximately 50 ft of clearance between the reef and the outcrop. The rock outcrop extends into the subtidal zone.

The intertidal portion of the rock outcrop consists primarily of bedrock and boulder which continues into the subtidal zone where the substrate changes to sand and shell debris. The intertidal and subtidal substrate at the crescent-shaped beach consist of cobble, gravel, and sand.

Although the range of species and distribution of intertidal flora is similar to the Little Lagoon and North Point LTFs, other varieties of macroalgae including *Pylaiella littoralis, Ulva/Monostroma* spp., and *Rhodomela larix* are relatively more abundant at Rabbit Cove. Five invertebrate species are dominant in the intertidal area, including the univalve (*Notoacmea scutum*), littorine snails, blue mussels, and hermit crabs.

The subtidal macroalgae community is composed largely of *Laminaria groenlandica* and *L. saccharina*. The density of attached kelp decreases seaward from 0 ft MLLW where the substrate changes to sand. Filter feeding serpulid

polychaete worms, the univalve (*Lepidozona mertensii*), and hermit crabs are common in the subtidal area. During 1994 field surveys accumulated shell debris was observed and twenty-ray starfish (*Pycnopodia helianthoides*) were seen feeding on clams including horse clams, sand clams, butter clams, and cockles. Scallops (*Chlamys rubida*) were also observed in the shallow subtidal area.

Evidence of river otter and wolf (*Canis lupus*) was also noted in the small cove immediately west of the LTF site. Several species of songbirds were observed, and the closest bald eagle nest occurs 1,000 ft northeast of the site.

Wildlife (Issue 4)

The Port Houghton/Cape Fanshaw project area contains two wildlife analysis areas (WAA) as designated by the Alaska Department of Fish and Game. These include WAA 2927, in the Chatham Area which includes VCU 78 (part of the Tracy Arm-Fords Terror Wilderness Area) outside and northeast of the project area, and WAA 1601 which is fully contained in the Stikine portion of the project area.

Wildlife Habitats

Existing vegetation GIS maps for the Port Houghton/Cape Fanshaw project area were reviewed and analyzed to develop a wildlife habitat map for use in identifying the amount, location, and extent of major habitat types used by wildlife. The wildlife habitat types coincide with the habitat classifications developed for the wildlife species that may occur in the project area. Analyses can then be conducted to determine the amount of each habitat type present in the project area and the extent of its use by wildlife species. The wildlife habitat map may also be used to visually review linkages among the habitat types and presence of wildlife migratory corridors. However, each wildlife species requires critical habitat components that may limit its distribution within a preferred habitat and between habitat types.

Estuary

An estuary is a semi-enclosed body of water having a free connection with the open sea, and within which the seawater is measurably diluted with freshwater deriving from land drainage (Knauss 1978). The largest estuary in the project area is at Sandborn Canal. Other significant estuaries occur at Port Houghton North Arm, Salt Chuck, and Farragut Bay North Arm. Smaller estuaries occur along the north and south shores of Port Houghton and the western shore of Cape Fanshaw. Estuaries comprise 2 percent of the project area (Table 3-8) with 150 animal species likely to use this habitat type; 76 species are considered local breeders.

Table 3-8

Acreages of Major Wildlife Habitat Types in the Port Houghton/Cape Fanshaw Project Area

Habitat Type	Acreage	Percent of Total
Estuary	4,354	3
Beach Fringe	4,973	3
Freshwater	1,035	<1
Scrub	4,969	3
Forest		
Volume Class 3	96	<1
Volume Class 4	33,206	24
Volume Class 5	24,867	17
Volume Class 6	22,107	15
Volume Class 7	703	<1
Bogs, Fens, and Peatlands	22,043	15
Alpine	21,987	15
Clearcut[1]	3,327	2
Total[2]	143,667	100

[1]All clearcut areas are on Goldbelt, Inc. lands.

[2]All land and water within the project area including Goldbelt, Inc. lands, Cape Fanshaw Natural Area, and state selected lands.

Source: Gunther 1995a

Beach Fringe

The beach fringe habitat type includes several substrates including rock, sand, and cobble. Shoreline vegetation of several plant associations may also be included. Beach fringe comprises 2 percent of the project area. Wildlife species inhabiting the beach fringe are similar to those that occur at estuaries.

Freshwater

Freshwater habitats include lakes and streams. Since adjacent riparian areas can be described as at least two habitat types (i.e., forest and riparian), riparian areas are not included in the freshwater habitat type to avoid doublecounting. To estimate the amount of freshwater stream acreage in the project area, the average stream width (12 ft) was multiplied by the total linear distance of all streams in the project area. Freshwater habitat is distributed throughout the project area and comprises less than 1 percent of the entire project area (Table 3-8). A few large high-elevation lakes occur in the project area including three unnamed lakes east of Port Houghton Salt Chuck, an alpine lake associated with Lincoln Peak, and smaller alpine lakes in the mountainous area north of Port Houghton. A total of 109 animal species use the freshwater habitat type of which 65 breed locally.

Scrub

The scrub habitat is comprised either of alder near streams or blueberry and menziesia in dryer areas. Few or no coniferous trees occur in the scrub habitat type. Most scrub areas in the Port Houghton/Cape Fanshaw project area occur in slide zones located on steep slopes at high-elevations. Two percent of the project area is classified as scrub habitat with a possible 100 wildlife species using this habitat type, including 78 species of local breeders.

Forest

All coniferous forested vegetation is combined into a single habitat type, then subdivided into subhabitats separated by volume class, because most of the overstory vegetation is of hemlock with small scattered areas of spruce and cedar. Tree species composition in the project area probably does not influence distributional patterns of wildlife species as much as volume classes. The entire forested project area is old-growth with natural disturbance patterns, except for the Goldbelt, Inc. lands which have been clearcut over the past seven years (with additional cutting planned over the next three years). Of the old-growth forest, most of the project area is of western hemlock forest volume classes 5 and 6 representing an average of 20 thousand board ft (MBF) or greater, and where trees commonly exceed 100 ft in height and 20 inches in diameter (Table 3-8). Canopy closure typically exceeds 60 percent and large-branched, deep-crowned hemlocks are common. Understory vegetation is dominated by western hemlock, blueberry, devil's club, and a variety of ferns and forbs (Martin et al. 1994).

Forested vegetation is distributed throughout the project area with most coverage along the shoreline areas from Sandborn Canal east and north and along the northwest portion of the south shore of Port Houghton. Other forested areas occur north and west of Dahlgren Peak, south of Dahlgren Peak, and Mount Fanshaw. A total of 181 wildlife species may use forested habitats. This includes 142 species of local breeders representing the largest number of local breeders of any habitat type.

Clearcut

The clearcut is a successional stage of the forested habitat characterized by minimal overstory trees, and a forb and shrub understory interspersed with fallen timber. Tree canopy cover ranges from 0 to 20 percent, and the primary understory species are hemlock, spruce, and cedar seedlings with similar forbs and shrubs as found in old-growth forests. Species most prolific are those adapted to sunlight conditions. Young clearcuts have higher understory species biomass than old-growth forests, thereby providing increased foraging opportunities for herbivores. However, the lack of overstory cover and the resulting lack of snow-intercepting potential limits winter use of these areas for some wildlife species.

Clearcuts occur entirely on Goldbelt, Inc. lands in the project area. The entire area is shown as a clearcut although small patches of old-growth are scattered throughout the area, and stream buffers occur adjacent to Class I and II streams. No recent aerial photographs exist for this area; consequently, an in-depth analysis of the exact amount of remaining old-growth is not possible. Land areas recently ceded to Goldbelt, Inc. in 1994 will be harvested over the next four years; they are shown as clearcut to portray cumulative effects of all planned activities in the project area. Because the area is private land, no field surveys were conducted in this portion of the project area. Clearcuts thus occur on 2 percent of the project area. A total of 93 wildlife species use clearcuts of which 54 species are known to breed locally.

Bogs, Fens, and Peatlands

Bogs, fens, and peatlands (also known as muskegs) occur in vegetated areas with poor drainage and wet soil conditions that inhibit tree growth. Trees may be present, but they are slow growing, and the maximum height attained is less than 60 ft. All bogs, fens, and peatlands are considered wetlands. Common plant species include deer cabbage, skunk cabbage, five-leaved bramble, goldthread, sphagnum, sedges, deer fern, and club moss. Downed woody material is scarce and decomposition is slow (Martin et al. 1994). Bogs, fens, and peatlands occur primarily in the southern portion of the project area, along Cape Fanshaw and north and east of Farragut Bay and represent 10 percent of the project area (Table 3-8). A total of 205 wildlife species use bogs, fens, and peatlands with 123 locally breeding species, representing the most wildlife species (57 percent of total) utilizing a single habitat type.

Alpine

When defining wildlife habitat types for the Port Houghton/Cape Fanshaw EIS, alpine areas represent ice, snowfields, high-elevation rock, low-productivity forests at high-elevation, and alpine plant communities. These areas are not considered for harvest due to the small tree stature. Dominant shrubs are blueberry, crowberry, copperbush, and cassiope. Common forbs are deer cabbage, five-leaved bramble, and bunchberry. Ferns and sedges are also present. Trees occupy a small portion of the area, are narrow in diameter, and rarely exceed 45 ft height. Tree crowns exhibit the "krummholz" appearance due to cold temperatures and wind. Alpine areas occur in the vicinity of Lincoln Peak and Washington Peak in the southwest portion of the project area; Tangent Peak, Man-of-War Peak, Alaska Peak and Saranac Peak west of Farragut Bay North Arm; Jamestown Peak northwest of Farragut Bay; Dahlgren Peak in the center of the project area; Mount Fanshaw east of Cape Fanshaw; and at the northern portion of the project area. Alpine habitat represents 10 percent of the project area (Table 3-8) with 71 animal species potentially using this habitat type including 49 species of local breeders.

Wildlife Travel Corridors

Wildlife travel corridors between specific habitat types are limited within the project area due primarily to the peninsular shape of the area and the interspersion of habitat types present. The primary wildlife corridors within the project area are the forested shoreline areas south and east of Sandborn Canal that continue northeast to North Arm and Salt Chuck and then west to Goldbelt, Inc. land. Another extensive wildlife corridor area is the northwest section of South Fanshaw north of the Chatham/Stikine Area boundaries. Other habitat types where extensive wildlife corridors exist include the bogs, fens, and peatlands in South Fanshaw and this alpine areas southeast of East Houghton. Wildlife habitat corridors are described in more detail below, and a complete discussion of patch size, edge, and other factors related to wildlife corridors is provided in the *Biodiversity* section of this chapter.

Because no **estuaries** are contiguous within the project area, movement between estuaries requires ambulatory (including swimming) or flight transport across other habitat types. Several estuaries and associated buffers are large enough to allow for most life requirements within a single estuary, particularly for smaller animals. Although 4,354 acres are shown as estuary habitat, 2,934 acres are buffers associated with these estuaries, and most of these buffer areas are upland forested areas.

Freshwater habitats primarily flow in north/south directions in the project area. In higher elevation areas freshwater habitats are isolated, thereby limiting dispersal for animals that are dependent on freshwater habitats as wildlife corridors. Most freshwater habitat occurs at low-elevations and in bog, fen, and peatland areas where some streams are additionally oriented in east/west directions. The areas with extensive freshwater habitat primarily occur in South Fanshaw (the Stikine portion of the project area). In contrast, at East Houghton and North Shore, almost all of the Class I and II (fishbearing) streams are oriented in north/south directions due to the steep topography and limited low-elevation areas. Animal dispersal for riparian-dependent animals is therefore limited in these areas. However, many Class III streams are not mapped, particularly in areas not frequented by the field crew, which includes the areas at North Shore and East Houghton. Therefore, dispersal along stream corridors may not be as limiting.

Wildlife corridors among **forested** habitats are extensive and limited only by the presence of bogs, fens, and peatlands, and alpine habitat. Similar to freshwater habitat, forested wildlife corridors are primarily oriented in a north/south direction throughout the project area. Travel east to west is possible in North Fanshaw but limited in South Fanshaw due to the extensive bogs, fens, and peatlands between forested areas. In East Houghton, wildlife movement in old-growth forest primarily occurs within one mile of the shoreline due to the alpine areas associated with the President's Range. Travel within old-growth forests in the North Shore is possible only in the shoreline forested habitat due to the clearcuts on Goldbelt, Inc. lands and the inland mountainous regions. The most favorable contiguous

old-growth habitats in the project area that provide maximum opportunity for travel occur at Sandborn Canal, the shoreline areas at East Houghton, North Arm and Salt Chuck, and the northwest corner section of North Fanshaw (south of Port Houghton but north of the Chatham/Stikine Area boundaries).

Dispersal among **scrub** areas within a mountainous area is possible; however, dispersal between noncontiguous mountainous areas entirely within the scrub habitat type is not possible. The three primary areas of scrub habitat allowing continuous dispersal are the President's Peaks, Dahlgren Peak, and the mountainous areas north of Port Houghton.

Large **bogs, fens, and peatlands** occur primarily in South Fanshaw. Optimum habitat occurs in this area for species that depend on large areas of this habitat type. These species would include greater and lesser yellowlegs, which were only seen in the large bogs, fens, and peatlands during 1994 field surveys. More foraging opportunities occur for red-tailed hawks in areas of large bogs, fens, and peatlands. This habitat type is limited in East Houghton east of Sandborn Canal and in North Shore east of Goldbelt, Inc. lands.

Five major **alpine** areas occur in the Port Houghton/Cape Fanshaw project area. Although alpine corridors within two of these areas are extensive (President's Range and the mountainous areas associated with North Shore), the three remaining areas (Fanshaw Range, Dahlgren Peak, and Jamestown Peak) are isolated from other alpine habitats. Jamestown Peak is narrowly linked with the southern peaks of the project area (Man-of-War Peak, Saranac Peak, Alaska Peak, and Tangent Peak) by one major ridgeline.

Management Indicator Species

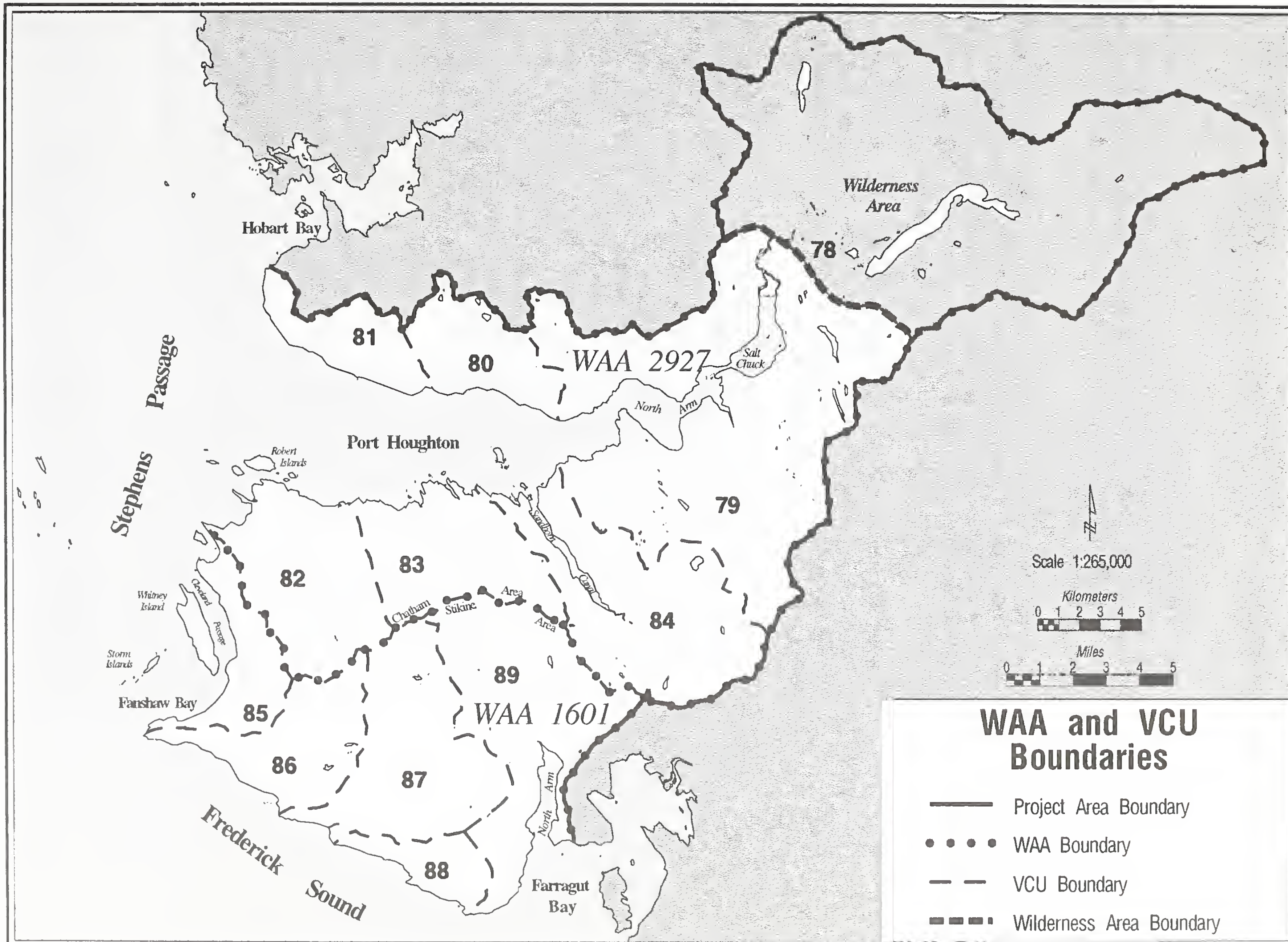
This section describes the results of the habitat capability models for the MIS species, as well as the habitat components required by each species. Field survey results and information on the presence of species in the project area as described during the public scoping comment period for this EIS are also presented. MIS models are run by WAA. WAAs are an ADF&G administrative designation that includes one or more VCUs used for wildlife analysis and to regulate wildlife populations. Note that WAA 2927 (the Chatham portion of the project area) also includes the adjacent wilderness area northeast of the project area (Figure 3-1) which results in a higher carrying capacity estimate for most species than if the MIS models only included the project area. Inclusion of the wilderness area adds 56,221 acres to the existing Chatham portion of the project area which is 90,717 acres for a total acreage of 146,938 acres in WAA 2927. WAA 1601 is 52,950 acres.

Sitka Black-tailed Deer

The Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) model evaluates deer winter range because winter is assumed to have the most limiting habitat

Figure 3-1

Port Houghton/Cape Fanshaw Project Area, Wildlife Analysis Areas, and Value Comparison Units



November 15, 1995

components for deer populations (Suring et al. 1992a). Deer in Southeast Alaska occur at the northern extent of their natural range and are limited by deep, persistent snowfall (Wallmo 1981). The amount of snowfall in areas of Southeast Alaska strongly influences the ability to support deer, as increasing snow depth makes deer survival more difficult.

Predation by wolves can have a strong influence on deer populations, particularly during severe winters. Conclusions supported by research conducted elsewhere (Suring et al. 1992a summary) show that deer populations may be reduced by 30 percent where predators occur under deep snow conditions, 20 percent under intermediate conditions, and 10 percent under low snow conditions.

The habitat capability model for Sitka black-tailed deer in Southeast Alaska uses several factors to predict deer habitat suitability. These elements include forest successional stage, snow depth, elevation, overstory species composition, aspect, volume class, predation, and riparian locations.

The deer model with predation was used to predict deer habitat capability within the project area. The predation component consists of estimating wolf presence and its predatory influence on deer populations. Results show no deer habitat capability in VCUs 79 and 84 due to the high snow level conditions in these areas. Of the remaining project area, most is considered unfavorable, except high-elevation alpine areas, which are rated as unsuitable (Table 3-9). Model analyses show the carrying capacity is 2,467 deer considering predation (Table 3-10). Predation does not have a large effect on deer (less than 10 percent of total carrying capacity), except that several areas are downgraded to lesser value habitat, and there is no high value Sitka black-tailed deer habitat in the Port Houghton/Cape Fanshaw project area considering the presence of wolves based on model results. The primary reason that deer do not occur in large numbers in the Port Houghton/ Cape Fanshaw project area is probably due to snow depth in conjunction with the presence of wolves.

During the summer months of the 1994 field season, infrequent deer sightings and pellet groups were observed. Tracks were most frequently recorded in riparian areas. ADF&G reported that deer pellet group transects were established on Robert Islands and on the mainland near Negro Creek in 1989; they found that pellet group densities were very low. The agency states that mainland deer densities throughout Southeast Alaska are low. Densities in WAA 2927 are particularly so because of the northerly exposure of most of the WAA and the average annual snowfall. The agency believes that a higher deer density in WAA 1601 occurs due to a more moderate snowfall and southerly exposure (ADF&G public scoping letter received October 1994).

Other deer surveys conducted jointly by the USDA-FS and ADF&G include a survey comprised of three deer pellet transects (in 1994) within VCU 89 and WAA 1601 commencing at the western shoreline of Farragut Bay and the northern

Table 3-9

MIS Species Habitat Capability (Acres) in the Port Houghton/Cape Fanshaw Project Area

	Unsuitable HSI=0		Unfavorable 0<HSI≤0.3		Marginal 0.3<HSI<0.7		Suitable 0.7≤HSI<1	
	WAA 2927	WAA 1601	WAA 2927	WAA 1601	WAA 2927	WAA 1601	WAA 2927	WAA 1601
Sitka black-tailed deer with predation	125,526	9,450	22,493	29,242	1,905	10,859	--	--
Mountain goat	83,913	45,319	52,770	3,053	11,884	23	1,358	1,158
Black bear	38,655	290	17,995	1,993	48,593	21,789	44,681	25,480
Marten	91,047	8,743	11,419	12,598	26,088	17,106	21,370	11,105
River otter	141,517	45,599	1,370	820	--	--	7,038	3,132
Bald eagle	142,752	46,406	133	13	2,078	1,408	4,963	1,725
Red squirrel	57,057	2,325	45,339	18,963	45,788	28,138	1,740	125
Vancouver Canada goose	100,789	21,497	27,375	6,535	20,530	14,393	1,245	7,127
Red-breasted sapsucker	61,005	2,408	41,451	18,933	21,483	3,864	25,985	24,347
Hairy woodpecker	102,456	21,340	13,624	13,735	12,362	10,612	21,483	3,864
Brown creeper	116,080	35,076	12,362	10,612	--	--	21,483	3,864

Note: Numbers for WAA2927 include VCU 78 which is outside the project area. The HSI for wolf cannot be calculated by the existing habitat capability model.

Source: Gunther 1995a

Table 3-10

MIS Carrying Capacities (Number of Individuals) Estimated by Habitat Capability Models

MIS Species	WAA 2927	WAA 1601
Gray Wolf	4	5
Sitka black-tailed deer	588	1,879
Mountain goat	282	28
Black bear	188	90
Marten	229	142
River otter	67	30
Bald eagle	185	78
Red squirrel	70,261	36,012
Vancouver Canada goose	145	131
Red-breasted sapsucker	9,192	5,675
Hairy woodpecker	1,581	649
Brown creeper	6,585	4,066

Source: Gunther 1995a

shoreline of North Arm (Blatt 1994a). Surveys were along a perpendicular line to the shoreline terminating 1 to 2 miles inland. A total of seven deer pellet groups were found in 314 plots (a mean pellet group count of 0.02). ADF&G surveyed VCU 82 (WAA 2927) near Negro Creek in 1989 with a mean pellet group count of 0.21. Using 1.0 deer pellet per transect equal to 32 deer per mi^2 (Kirchoff 1993a), then the deer density is 0.006 deer per mi^2 in the area sampled. In comparison, mean pellet group counts for the entire Southeast Alaska deer transects (including all historical surveys) ranged from 0.01 to 3.59. Although no statistical analyses were conducted from these transects, most of the 93 surveyed areas had higher mean pellet group counts than the Negro Creek area.

The ADF&G developed deer population objectives for Sitka black-tailed deer in Southeast Alaska based on historical, current, and future predicted hunting demand; habitat capability; and sustainable harvest rate (ADF&G 1992). In most cases where hunting demand is not high, the ADF&G allowed a 25 percent reduction in population objectives from populations predicted using the habitat capability model. However, if the 25 percent reduction resulted in less than 500 deer, then no change from the habitat capability model was recommended. ADF&G determined that WAA 2927 had a 1990 habitat capability of 538 deer and the agency's population objective was that no net loss of deer occurs, to ensure population viability. The agency states that, for WAA 2927, deer habitat quality is poor, land is steep, and predators (black and brown bears and wolves) are present throughout the area. Hunter demand in WAA 2927 is unknown; the number of hunters in WAA 2927 were 0, 5, and 6 for the years 1987, 1988, and 1989 respectively. A total of 45 hunter-days spanned these three years. No deer were reported harvested in this WAA from 1987 to 1989. The ADF&G deer

harvest summary statistics for 1993 show no deer harvested in WAAs 2927 or 1601, although the response rate was 38.59 and not all hunters received a survey form (ADF&G 1994b).

For WAA 1601, ADF&G predicted a habitat capability of 1,398 deer during 1990 and allowed a 25 percent reduction for its population objective (ADF&G 1992). Hunter demand is unknown for this WAA and the number of hunters from 1987 to 1989 was 5 hunters in 1987 only, with a total of 10 hunter-days. No deer were reported harvested in WAA 1601 over these three years.

Mountain Goat

The mountain goat (*Oreamnos americanus*) is a species that ADF&G considers to be of special concern in the Port Houghton/Cape Fanshaw project vicinity. ADF&G (1994c) believes that goats can be impacted by logging activities and improved human access, including logging camps and roads. ADF&G is opposed to cutting of any goat winter range, and they recommend identification of winter range and mitigation to prevent impacts.

Mountain goats typically use alpine and subalpine habitats for summer foraging, but they descend into forested areas for winter forage (Fox et al. 1989). In southeastern Alaska, mountain goats typically have year-round home ranges between 4 to 8 mi^2, although some individuals have ranges as large as 35 mi^2 (Fox et al. 1989). Winter-use areas are usually much smaller than summer areas. Mean distances between summer and winter ranges have been recorded as 1.4 miles for females and 1.8 miles for males. Areas actually used within the home ranges tended to be associated with patches of steep, rugged terrain, and daily movements were often very small. The longest moves were made by males during the rutting season and could involve travel across forested valley bottoms.

Mountain goats are susceptible to predation by several large carnivores, but the wolf is the only one likely to be important (Fox et al. 1989). The goats' primary strategy for predator avoidance is to escape in steep and broken terrain. Escape terrain is defined as a slope of 50° or greater and broken up with outcrops. Throughout the year, goats spend about 90 percent of their time within 1,300 ft of escape terrain, and in the winter, they are within 820 ft about 95 percent of the time (Fox et al. 1989).

Results of the goat habitat modelling for the Port Houghton/Cape Fanshaw project area show mountain goat habitat occurring in high-elevation areas with no definitive corridors between most areas, except near the Port Houghton Salt Chuck. The carrying capacity derived from the mountain goat model is 310 individuals (Table 3-10). Of the mountain goat habitat available, most is considered unsuitable and unfavorable (Table 3-9) but is intermixed with small pockets of either marginal or suitable habitat.

During a mountain goat survey in the Port Houghton/Cape Fanshaw area, fifty-one goats were located on Dahlgren, Jamestown, and Washington peaks. All of these sightings were above the tree line in alpine meadows or on snow or rock, and all goats were close to escape terrain. In addition to these sightings, several other reports of mountain goats were submitted by other members of the project team. One of the helicopter pilots observed 15 goats on Dahlgren Peak, above proposed unit 27105 (153). One group of mountain goat pellets was found near the south end of proposed unit 27103 (158). Evidence of mountain goats was also found in bogs, fens, and peatlands near proposed unit 29115 (150). Mountain goat pellets were also found in proposed unit 322044 (133).

It is likely that the goats on the Fanshaw Peninsula (Dahlgren, Jamestown, and Saranac) move between the peaks. Goat movements between the Fanshaw peaks and the President's range are probably extremely rare if they occur at all.

Public scoping comments received from the ADF&G for this EIS (October 1994) state that there are several discrete populations of mountain goats in the project area. In the north shore of Port Houghton between Alice Lake and the peak with the Triplet C bench mark, 43 goats were seen by ADF&G. The agency believes that the number seen is typically 50 percent of the total population. Therefore, ADF&G estimates that 80-90 goats occur on these peaks and winter in the medium- to high-volume old-growth timber on the slopes between the mountain and shoreline.

ADF&G states that the population of goats in the President's Range (including Washington, Lincoln and Grant peaks) was surveyed in 1989, with 48 goats observed. A Forest Service survey in 1994 resulted in 50 goats observed in this area. ADF&G states that the valley between Washington and Lincoln peaks is likely winter range for these goats, as well as the Sandborn Creek valley. Additional mountain goat populations in the project area occur on Fanshaw Peninsula and at Dahlgren and Jamestown peaks. In 1981 Forest Service biologist Joe Doerr observed goats in the Saranac-Tangent range. He observed 29 goats occupying the Tangent Peak-Saranac Peak Ridge, Jamestown and Dahlgren peaks. Mountain goats also occur on Triplett Peak in the North Shore area. An ADF&G survey team observed 25-30 goats in this area during June 1995.

Black Bear

The habitat capability model developed for the black bear (*Ursus americanus*) uses several factors to determine the most suitable habitat (Suring et al. 1988). These factors vary by season and include forest type (with highest preferences for low- to mid-volume forests; bogs, fens, and peatlands; and subalpine). Avalanche slopes are preferred in spring. Riparian habitats and stream channel types conducive to high salmon production are preferred during late summer and fall.

Black bear observation and sign occurred throughout the project area, although bears appeared to be most plentiful near the Sandborn Canal. The habitat capability model for the project area shows that most of the project area is either suitable or marginal for black bear (Table 3-9). Carrying capacity is estimated at 278 bear (Table 3-10). Model estimates included a 2-mile buffer area on the roads in Goldbelt, Inc. lands. Hunters and guides have reported a higher than usual percentage of cinnamon color phase black bears in the Port Houghton area (public scoping comment received during public scoping meetings in September 1994 and public scoping letters received from the public and ADF&G).

Brown Bear

Brown bears (*Ursus middendorffi*) are not abundant within the project area. The brown bear habitat capability model does not map brown bear habitat because a portion of the model reviews historical sightings of bears and identifies no suitable habitat if few or no sightings occurred. However, two individuals are believed to reside near Farragut Bay and one bear is believed to reside near the southern drainage (Glenn Creek) of Port Houghton North Arm (comments received from the public during Port Houghton/Cape Fanshaw public scoping meetings September 1994). Brown bear distribution in the project area is limited. It is also believed that subadult bears occasionally wander in the area in search of a territory.

Marten

The distribution of marten (*Martes americana*) is determined primarily by the availability of suitable canopy cover and the presence of prey during the winter months (Simon 1980). Since timber volume is correlated with canopy cover, volume is used as a predictor of suitable marten habitat for determining habitat capability (Suring et al. 1992b). Additional predictor factors used are stand class size, low-elevation, and nearness to water. For the Port Houghton/Cape Fanshaw project area, high-elevation areas are considered unsuitable marten habitat, presumably due to snow depth and lack of cover. Suitable habitat occurs along the shorelines of both saltwater and freshwater. Overall, the study area has a mixture of suitable, marginal, unfavorable, and unsuitable habitat (Table 3-9) with most of the area being unsuitable. Carrying capacity is estimated as 371 individuals (Table 3-10). Marten scat was observed during field surveys in units 333086 (111) and 321017 (88).

River Otter

The factors used in the habitat capability model for estimating river otter (*Lontra canadensis*) suitability include presence of productive old-growth, absence of clearcuts, and presence of Class I and II streams that produce fish for prey. For the Port Houghton/Cape Fanshaw project area, river otter habitat is restricted to

the shoreline of saltwater/shoreline interface with some additional habitat upstream of Class I streams. As a result, most of the project area is unsuitable (Table 3-9). Carrying capacity is estimated at 97 river otter in the project area (Table 3-10). River otter burrows and dens were observed throughout the coastal shorelines of the project area.

Bald Eagle

The habitat capability model for the bald eagle in the Port Houghton/Cape Fanshaw project area shows suitable habitat along the Port Houghton/Cape Fanshaw project area coastline and marginal habitat along Sandborn Canal, although most of the area is unsuitable (Table 3-9). Carrying capacity is estimated as 263 individuals (Table 3-10). Bald eagles and their nest sites were observed frequently along the shoreline by the 1994 field crew, but no bald eagle nests were observed inland. The bald eagle nest site map developed by the USFWS for the Port Houghton/Cape Fanshaw project area during 1993 field surveys closely approximated the observations of bald eagles by the field crew. Bald eagle nests were typically observed ½ mile apart along the north and south shores of Port Houghton. Some scattered nests were observed along the shoreline of Sandborn Canal nearest Port Houghton. The USFWS typically observes 150 nest sites annually along the shoreline of Port Houghton, Sandborn Canal, and the outer shoreline of Cape Fanshaw.

Red Squirrel

Optimum red squirrel habitat is considered old-growth Sitka spruce forest in Southeast Alaska (Suring 1988a). Western hemlock and cedar forests provide lesser food resources. Most of the Port Houghton/Cape Fanshaw project area is either marginal or unfavorable habitat for red squirrels, with small pockets of suitable habitat (Table 3-9). Carrying capacity is estimated at 106,273 individuals (Table 3-10). Red squirrels were observed in most all unit and road locations in the project area.

Vancouver Canada Goose

The habitat capability model for the Vancouver Canada goose (*Branta canadensis fulva*) uses several factors to determine habitat suitability (Doyle et al. 1988). Favorable habitat conditions used by the model include the presence of old-growth forest; nearness to intertidal estuarine habitat; abundance of blueberry or huckleberry; wet conditions; proximity to rivers, lakes and/or salt water; and lack of roads. From results of the habitat capability models for the Vancouver Canada goose, most of the project area is considered unsuitable habitat (Table 3-9). Carrying capacity is estimated as 276 individuals (Table 3-10). The most favorable areas occur in the southern portion of the project area where extensive tracts of wet conditions intermixed with old-growth forest occur. Vancouver Canada geese were infrequently seen in or near proposed harvest units including

units 29101 (125), 333081 (63), 333090 (84), 341103 (135), and 341109 (149). During field investigations conducted for the Port Houghton EA (USDA-FS 1983a), the prime Canada goose nesting habitat was identified as a 16-acre unnamed lake located between Sandborn Canal and Farragut Bay North Arm. The lake flows into North Arm Creek.

Red-breasted Sapsucker

Red-breasted sapsucker (*Sphyrapicus ruber*) abundance has been observed to be greatest in low-volume, old-growth western hemlock and Sitka spruce stands with large trees (Hughes 1985). The habitat capability model developed for this species is based entirely on breeding habitat factors, particularly timber volume (Suring 1988b), and reflects the red-breasted sapsucker's preference for low-volume, old-growth stands by rating these areas the highest suitability. Low suitability is identified as mid- to high-volume stands, subalpine, hardwoods, and managed forest stands. Red-breasted sapsuckers were observed throughout the project area. Habitat capability results for the red-breasted sapsucker show slightly more marginal and suitable habitat (57 percent) than unsuitable and unfavorable habitat (Table 3-9). Carrying capacity is estimated at 14,867 individuals (Table 3-10).

Hairy Woodpecker

Habitat preference of hairy woodpeckers (*Picoides villosus*) in the Tongass National Forest is described as old-growth stands of western hemlock and Sitka spruce with a volume of 30 MBF or greater (Hughes 1985). Hairy woodpeckers forage in clearcuts, second growth, and nonforested habitats only in the summer. The habitat capability model developed for the hairy woodpecker for winter habitat is thus limited to the presence of high-volume old-growth timber and the absence of clearcuts, nonforest, second growth, and hardwoods (Suring 1988c).

Hairy woodpeckers were infrequently observed and heard in the project area by large stream riparian corridors. The habitat capability model for the Port Houghton project area identifies most of the project area as unfavorable or unsuitable habitat (Table 3-9). Carrying capacity is estimated at 2,230 individuals (Table 3-10). Suitable habitat occurs along Sandborn Canal, along some shoreline areas, and along some Class I unnamed streams.

Brown Creeper

The habitat capability model developed for the brown creeper (*Certhia familiaris*) identifies suitable habitat as old-growth coniferous forest of 30 MBF or greater. Lesser value or unsuitable habitat is of lower volume or consists of timber-managed areas, hardwoods, subalpine, and nonforested areas (Suring 1988d). Brown creepers were seen and heard as an uncommon species in the Port Houghton project area. Maximum densities are expected to occur in high-volume

timber stands near the outlet of Sandborn Canal and some Class I streams with adjacent high volume timber. However, most of the project area is considered unfavorable or unsuitable habitat (Table 3-9). Carrying capacity for the brown creeper is estimated at 10,651 individuals (Table 3-10).

Moose

Moose (*Alces alces*) are believed to have occurred in the project area since the early 1970s (public comment from a big game hunting guide using the area). Moose and their sign were observed by the field survey crew and have been reported to occur in the project area by many of the tourists frequenting the area. Moose pellet counts were conducted near North Arm and the western shoreline of Farragut Bay in 1994 (Blatt 1994a). A total of 17 pellet groups were observed in 314 plots (0.054 pellet groups per plot).

Moose have been hunted in the project area, although harvest data indicate that only one moose is taken from the project area by Petersburg residents each year and one moose has been harvested by Hobart Bay residents. The Port Houghton EA for a proposed timber sale in the project area (USDA-FS 1983a) states that moose are present at low densities in the project area, and that the Tongass Land Management Plan identified the Farragut Bay North Arm drainage as a candidate area for moose management. However, the EA also stated that riparian stands of willow and cottonwood, the preferred moose habitat, were absent from the project area. During public scoping, the ADF&G stated that more hunting of moose is occurring which may result in an overharvest of moose.

Marine Mammals

Sightings of marine mammals by the Port Houghton interdisciplinary team occurred during summer 1994 field surveys. A total of five marine mammals were observed by the interdisciplinary project team during summer 1994 (humpback whale [*Magaptera novaengliae*], Steller sea lion [*Eumetopias jubatus*], harbor seal [*Phoca vitulina*], Pacific white-sided dolphin [*Lagenorhynchus obliquidens*], and minke whale [*Balaenoptera acutorostrata*]). All sightings occurred in Port Houghton from June to August 1994. All animals observed were feeding, breeching, sounding, and/or swimming. No breeding activity was observed.

Written comments received during the Port Houghton/Cape Fanshaw public scoping comment period additionally indicate that false killer whales (*Pseudorca crassidens*) visit Sandborn Canal and killer whales (*Orcinus orca*) frequent the area feeding on the abundant salmon. Comment letters from the Port Houghton EA (USDA-FS 1983a) discuss the importance and presence of humpback whales in Port Houghton. Additional marine mammals that may occur in the project area based on their overall distribution patterns, although not seen by project personnel or noted through agency or public comment include: California sea lion (*Zalophus californianus*), northern elephant seal (*Mirounga angustirostris*), Baird's beaked whale (*Berardius bairdii*), Stejneger's beaked whale (*Mesoplodon stejnegeri*), Cuvier's beaked whale (*Ziphius cavirostris*), sperm whale (*Physeter catodon*), striped dolphin (*Stenella caeruleoalba*), right whale dolphin (*Lissodelphis borealis*), grampus (*Grampus griseus*), common pilot whale

(*Globicephala melaena*), harbor porpoise (*Phocoena phocoena*), Dall porpoise (*Phocoenoides dalli*), blue whale (*Balaenoptera musculus*), fin whale (*B. physalus*), sei whale (*B. borealis*), and right whale (*Balaena glacialis*).

Biodiversity (Issue 5)

Biological diversity (or biodiversity) has typically been defined to include the variety of life in an area, including genetic composition, richness of species, distribution and abundance of ecosystems and communities, and the processes by which all living things interact with one another and their environment (McCabe and Pank 1994). Biodiversity includes the type, distribution, and abundance of organisms in biological communities, as well as the structure and function of associated ecosystems. Biodiversity considerations encompass several levels of biological organization including landscape ecology, community and ecosystem ecology, population ecology, and population genetics.

At the landscape level, biodiversity includes processes and conditions that affect the linkages between ecosystems and ecosystem components. At the community and ecosystem level, biodiversity includes the organization of species into communities and ecosystems, as well as the diversity of species, succession, predation, patterns of energy flow and other functional properties of ecosystems. At the population level, biodiversity includes factors affecting the distribution and size of species. Finally, at the genetic level, biodiversity includes the genetic composition and genetic variation within species that enable them to survive and adapt to changing environmental conditions (Office of Technology Assessment 1987; Noss and Harris 1986; Council on Environmental Quality 1993).

As defined above, biodiversity includes most biological concepts applicable to the natural environment. For the purpose of this EIS, the definition of biodiversity will follow that of McCabe and Pank (1994), and should be considered an ecological condition with respect to plant communities, wildlife habitat, and the landscape context of these attributes (including corridors, patches, etc.) (Noss and Harris 1986). In a given area, biodiversity is the maximum potential level of natural ecological integrity.

For the Port Houghton/Cape Fanshaw project area, elements of biodiversity that are functional to land management planning and actions are considered. Biodiversity addresses the potential alteration of plant communities and ecosystems that could change the biodiversity condition of the project area.

The Port Houghton/Cape Fanshaw analysis evaluates biodiversity elements at the landscape and community level of organization (Table 3-11) (Fincher and Paustian 1994). As shown in the table, most biodiversity elements are described in

Table 3-11
Biodiversity Analyses for the Port Houghton/Cape Fanshaw Project Area

Biodiversity Element	Data Sources	Element Description
Geology and Landforms	Soil mapping and classification, geology reports, and topographic mapping	Refer to geology, minerals, soils section.
Plant Associations and Plant Species Richness	Vegetation maps, wetland maps, and forest stand classification, plant field surveys	Refer to vegetation section.
Old-Growth Forest	Vegetation maps and forest classification stand exams	Refer to vegetation section.
Wildlife Corridors	Vegetation, floodplain, and stream maps	Refer to wildlife section.
Wildlife	Wildlife field studies and species habitat requirements; habitat capability models for MIS	Refer to wildlife section.
Fisheries and Aquatic Resources	Stream surveys and fisheries evaluation, water quality surveys, and stream type maps	Refer to fish and water resources section.
Threatened and Endangered Species	TES plant and animal surveys	Refer to wildlife and marine sections.
Coastal/Shoreline Habitat	Vegetation maps, GIS database, and marine habitat evaluations	Refer to marine section.
Plant Succession and Temporal Changes	Location of past and present harvest units, examination of revegetation patterns in harvest areas, and areas of natural disturbance; postharvest reforestation prescriptions	Refer to vegetation section.
Fragmentation and Habitat Patchiness	Vegetation maps and forest classification	Described in biodiversity section.

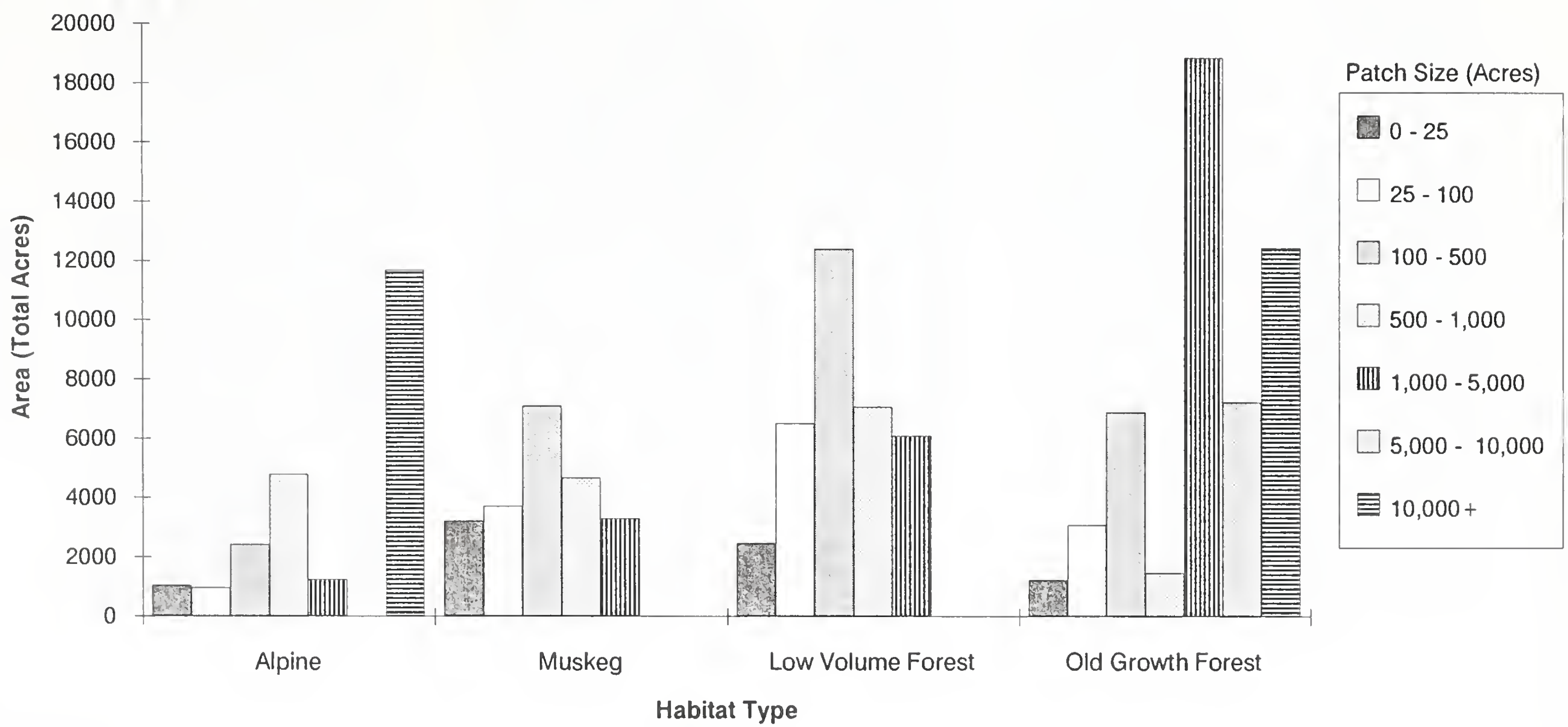
Source: Kelley 1995a

discipline-specific sections of this EIS. Described in this section are biodiversity elements not discussed elsewhere. These levels of organization are appropriate levels for biodiversity analysis since forest management activities generally alter biodiversity conditions at these levels, and because these levels integrate processes of population ecology and population genetics.

Natural Fragmentation of Old-growth Forest

The complex vegetation structure of old-growth forest (including large-branched, deep-crowned hemlocks, snags, understory shrub and herb communities) enhances wildlife habitat values. Similar to other vegetation types in the project area, old-growth forest is naturally fragmented and interspersed among other communities, particularly muskeg and lower productivity forests (Figure 3-2). However, old-growth forests are the least fragmented plant community type in the project area and contiguous blocks of up to 12,400 acres of high-volume old-growth forests occur.

Figure 3-2. Distribution of habitat patches by type and size in the Port Houghton/Cape Fanshaw project area.



Edge habitat in high-volume old-growth forests is frequently unsuitable for many wildlife and plant species that depend on interior forest conditions. The edge between high-volume old-growth forests and other habitat types is likely to have different micro-climates and vegetation structure, greater predation rates, and increased light conditions when compared to interior habitats in these stands.

Patch shape and the patch shape index are a measure of habitat edge. In the Port Houghton/Cape Fanshaw project area, larger habitat patches are more irregular than smaller habitat patches, and the patch shape index for larger patches of old-growth (and other habitat types) typically increases with patch size (Figure 3-3). The amount of edge versus interior habitat is often difficult to quantify for a variety of reasons (Payne and Bryant 1994), but if habitat edge is assumed to be about a 330-ft perimeter around patches, then for old-growth forests, edge habitat is about 30,600 acres (about 55 percent of total old-growth forest) for the project area.

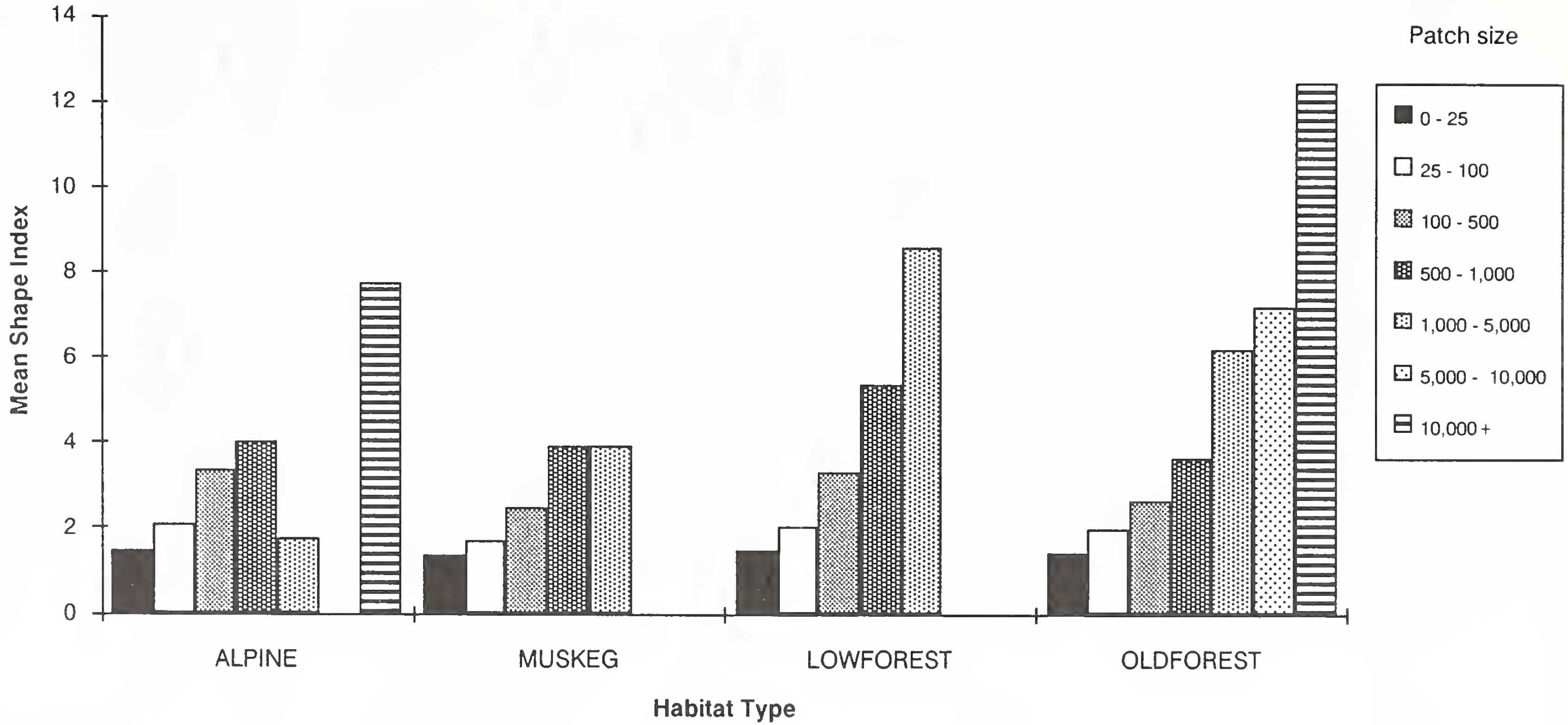
While large, irregular old-growth patches contain significant habitat edge that reduces their effectiveness for interior wildlife species, these patches often function as corridors that facilitate the movement or dispersal of wildlife that depend on old-growth. Volume class 3, 4, 5, 6, and 7 forests create extensive corridors through much of the non-alpine portion of the project area.

Old-growth forests provide habitat to a diverse group of wildlife species. For survival, many of these species require specific habitat attributes that only occur in old-growth forests. Because of the relatively slow growth rate of trees in Southeast Alaska, and the focus of timber management in these systems, old-growth forests are most vulnerable to human modification of habitat conditions, yet are least able to recover from this disturbance. Several hundred years are needed to develop similar old-growth conditions as those that presently occur. For these reasons, it is important that timber management activities be planned carefully to maintain functioning reserves of old-growth forest.

Summary of Existing Biodiversity

Biodiversity in the Port Houghton/Cape Fanshaw project area is typical of undisturbed areas throughout much of coastal Southeast Alaska. The area contains a diversity of vegetation types that have largely developed in response to topographic conditions. For example, elevation controls the distribution of alpine areas, while slope is an important factor in determining the location of brush vegetation (often restricted to steep mountain slopes), muskeg (typically occurring on gently sloping ground where drainage is restricted), and forests (frequently occurring on moderate to steep well-drained sites). Slope is also important in controlling the distribution of aquatic conditions, particularly situations suitable for fisheries habitat, and the development of river mouth estuarine areas.

Figure 3-3. Patch Shape index for habitat patches in the Port Houghton/Cape Fanshaw project area.



Ecological conditions in the project area reflect natural processes without human intervention. Because most of the area has received minimal human disturbance, exotic (introduced) plant species are largely lacking from the project area. Likewise, non-game wildlife populations may also be at natural levels. Thus, the biodiversity of the project area generally reflects a state of natural equilibrium, where measurable changes in ecological conditions are minor when taken as a whole.

The diversity and abundance of fish, marine invertebrates, and macroalgae are a significant contribution to the biodiversity of the project area. In addition to these aquatic species, many terrestrial wildlife species depend on marine food resources for all or part of their diet. Port Houghton (including its associated estuaries, intertidal habitat, subtidal habitat, and the Salt Chuck) supports marine and anadromous fisheries that provide significant ecological, commercial, and recreational value.

The biodiversity of the project area may be important to the re-establishment of wildlife populations on recently clearcut Goldbelt, Inc. lands (about 3,830 acres) located within and north of the project area. Animal species using habitats in the project area are likely to disperse and colonize suitable habitat as new forests mature on Goldbelt, Inc. lands.

The biodiversity of the project area is enhanced by several disturbance factors (most commonly mass wasting and windthrow) that modify existing vegetative conditions and contribute to habitat diversity. Mass wasting is limited to steep, unstable slopes, and results in non-forested habitat (either scrub or unvegetated slides). Windthrow occurs in forests throughout the project area and results in temporary openings in otherwise dense forest canopies, thus creating habitat for plants and animals that depend on early successional environments. Windthrow, by uprooting trees and disturbing the soil, affects soil characteristics, including improved drainage properties and improved fertility.

The mosaic of landform and environmental conditions present in the project area enhances the diversity of plant and animal species present. For example, while old-growth forests provide forage and breeding habitat for a wide variety of wildlife species, 29 percent of the breeding wildlife and 50 percent of all wildlife species expected in the project area, do not use forested habitats. However, forested habitat dominates the area, and this habitat is important to many species of wildlife as habitat; it is critical to protecting fisheries habitat from excess runoff, sedimentation, and erosion. Because forested habitats are the most impacted by timber management activities, the wildlife and habitat relationships present must receive careful analysis and consideration during the alternative development and impact analysis phases of timber harvest planning.

Threatened, Endangered, Candidate, and Sensitive Species (Issue 5)

Plants

The Tongass National Forest forest-wide standards and guidelines provided in the *Tongass Land Management Plan Revision* (USDA-FS 1991) require identification of threatened, endangered, and sensitive plant species, and consideration of management activities that avoid or minimize impacts to these species. An evaluation of the Port Houghton/Cape Fanshaw project area was conducted to identify these species that may occur in the project area.

No plants listed as threatened, endangered, or are proposed for this status are expected to occur in the project area. The only threatened, endangered, or proposed plant in Alaska is *Polystichum aluticum*, which is listed as endangered. It is only known from Adak Island and is not expected east of the Aleutians. Two plants designated by the USFWS as Category 2 (requires additional information to propose as threatened or endangered) could occur in the project area based on distributional data. These plants are: *Calamagrostis crassiglumis* and *Carex lenticularis* var. *dolia*.

Twenty-two vascular plants are designated as sensitive in the Alaska Region by the Forest Service. Based on the distribution of these plants and the types of habitats that occur in the Cape Fanshaw, Port Houghton vicinity, nineteen of these species could occur in the project area, although only *Poa laxiflora* has been found in the project area.

Botanical surveys for all sensitive species potentially present in the project area were conducted in forest, muskeg, riparian, estuary, beach, aquatic, and alpine plant communities. Surveys were concentrated in areas where forest management activities (including harvest units, roads, sort yards, and log transfer facilities) are planned. A total of 145 plant species were identified in the project area. A Forest Service sensitive plant (*Poa laxiflora*, loose-flowered bluegrass) was observed in the Sandborn Canal estuary, where it was previously reported. No other sensitive plants were seen in the project area.

Fish

There are no threatened or endangered fish species in the project area. Two fish species of special interest occur in the project area. These species are sockeye salmon (*Oncorhynchus nerka*) and cutthroat trout (*Salmo clarki clarki*). Sockeye salmon spawn in the Rusty River drainage in the northeast portion of Salt Chuck. Chinook salmon (*Oncorhynchus tshawytscha*) are also suspected to use the Rusty River watershed for spawning and rearing. Cutthroat trout occur throughout freshwater streams in the project area.

Wildlife

Endangered

Peregrine Falcon - All three North American subspecies of the peregrine falcon (*Falco peregrinus*) may seasonally occur in the project area. Both the endangered American peregrine falcon and the recently delisted Arctic peregrine falcon migrate along the coasts of Alaska to and from their South American wintering grounds (Ambrose and Riddle 1988). Consequently, either species could pass through the Port Houghton/Cape Fanshaw vicinity during migration. Peale's peregrine falcon, which is a USDA-FS sensitive species, is a year-round resident in coastal regions of the Aleutians, the Gulf of Alaska, and the outer coast of Southeast Alaska (Ambrose et al. 1988). Very little information is available on breeding populations of this species in Southeast Alaska, although one survey of 1,068 miles of coastline south of Yakutat found 36 occupied nest territories (Ambrose et al. 1988). An estimated 600 pairs of Peale's peregrines occur in Alaska with more than 140 territories from the Kenai Peninsula south (Ambrose et al. 1988).

No peregrine falcons were observed during field data collection at Port Houghton/Cape Fanshaw. Some suitable cliff nesting habitat is present along the shore of Port Houghton and Cape Fanshaw, but most of the coastline is comprised of forested slopes that provide few or no adequate nesting platforms. Some suitable nest sites might be available on the alpine cliffs of Dahlgren, Jamestown, and Washington peaks, but these sites are far from the better foraging areas along the coast. It is unlikely that there would be more than a very few nesting pairs in the entire Port Houghton and Cape Fanshaw vicinity. Use of this area by migratory peregrines is largely unknown, but it is likely that some migrating peregrines follow shorebirds and other potential prey along the Cape Fanshaw and Port Houghton coastline.

Category 2

Spotted Frog - The spotted frog (*Rana pretiosa*) is a Category 2 candidate for listing as threatened or endangered. This frog has experienced serious population declines in Washington and Oregon, primarily due to competition with and predation by the introduced bullfrog and non-native fish species (Leonard et al. 1993). The spotted frog is the only frog species likely to be present in the Port Houghton/Cape Fanshaw region of Southeast Alaska. Spotted frogs are almost always found in or near perennial water bodies, including springs, lakes, ponds, and slow streams. They are usually associated with herbaceous wetland plant communities, particularly sedges, rushes, and grasses.

No spotted frogs were observed by the wildlife team during field work in the Port Houghton/Cape Fanshaw vicinity. Bogs, fens, and peatland pools in the vicinity of goshawk or murrelet surveys were examined for frogs with no success, although these ponds and adjacent wetland areas would appear to provide suitable habitat for spotted frogs.

Trumpeter Swan - The trumpeter swan (*Cygnus buccinator*) is a USDA-FS sensitive species that breeds in the forest wetlands, rivers, and lakes of Alaska, and generally winters along the estuaries and open-water lakes of southcentral and Southeast Alaska (Belrose 1980; Armstrong 1990). Prominent wintering concentrations in Southeast Alaska have been found on Prince of Wales Island (Belrose 1980) and Blind Slough near Petersburg (Armstrong 1990; Walsh 1992) where they are often in association with the tundra swan. At Blind Slough, tundra swans comprise 3 to 9 percent of the wintering swan population.

It is likely that trumpeter swans occasionally winter in the project area, although this has not been confirmed. Residents of Farragut Bay reported 30 to 40 swans winter each year in that estuary, and winter swan surveys conducted jointly by the USDA-FS and USFWS in the Stikine Area since 1990 have reported small groups of swans using the Farragut River Valley (9 and 3 in 1991 and 1992, respectively). However, none of these birds were confirmed to be trumpeter swans, and all wintering area locations are likely outside of the project area.

Harlequin Duck - The harlequin duck (*Histrionicus histrionicus*) is a Category 2 candidate for listing as threatened or endangered. In North America it is found along northern parts of the east and west coasts. Harlequin ducks breed along rocky streams, generally in forested areas, where they build nests in tree cavities (Cassirer et al. 1993) or piles of rocky or woody debris (Burleigh 1972) close to streams. In winter, they move down to rocky, marine coastlines. Harlequin ducks feed mainly on crustaceans, mollusks, and aquatic insects that are captured by diving and foraging along the rocky bottom (Cottam 1939; Vermeer 1983; Gaines and Fitzner 1987).

There were relatively few sightings of harlequin ducks in the Port Houghton/Cape Fanshaw vicinity. Flocks of harlequins have been observed in Port Houghton from early summer through fall, including at the mouth of Negro Creek. It seems likely that harlequin ducks are breeding along streams in the project area, but no nests or other observations were made by biologists during surveys. No nest sites or females with broods were observed.

Northern Goshawk - The northern goshawk (*Accipiter gentilis*) is a Category 2 candidate and a USDA-FS sensitive species. The Queen Charlotte goshawk, the subspecies endemic to Southeast Alaska, has especially been a focus of concern because of its low natural densities, restricted distribution, and the perception that intensive timber harvest in the region has reduced goshawk habitat capability (Crocker-Bedford 1994). Goshawks are generally associated with mature or old-growth forests, and the loss of breeding and wintering habitat associated with timber harvest is a threat to goshawk populations (Titus et al. 1994). A radio-telemetry study of goshawks in Southeast Alaska found that almost 90 percent of relocations were in old-growth forests, and only about 10 percent were in second-growth forest or other habitats (Titus et al. 1994). About 68 percent of

relocations were in volume classes 5 or 6, and 24 percent were in volume class 4. Only about 1 percent of relocations were in noncommercial or nonforest habitat. Home range sizes calculated in the same study showed wide variability. During the breeding season, male home ranges varied from 1,800-47,955 acres, and female home ranges varied from 675-275,300 acres. Results for females showed extremely high variation because two of the eight females during the study abandoned their territory during the fledgling dependency period.

Observations of northern goshawks and nest locations in the Port Houghton/Cape Fanshaw project area occurred during summer 1994. Three nests with nestlings or fledglings were located, and goshawks were seen or heard in 18 of the proposed units. Goshawk pellets were collected at two of the nest sites. Analysis of these pellets found remains of Steller's jay (*Cyanocitta stelleri*), small birds (junco or warbler size), and small rodents (probably red squirrel, based on sizes of bones, incisors, and molars).

In addition, the adult female at one of the nest sites (Cat Creek) was captured and fitted with a radio-collar by the ADF&G. This bird was relocated nine times during July and August 1994, at distances ranging to nearly 5 miles from the nest. A home range of 6,688 acres was calculated based on these relocations.

<u>Osprey</u> - The osprey (*Pandion haliaetus*) is a species that is considered to be sensitive and of special concern by ANHP and the USDA-FS. It feeds almost exclusively on fish, and its distribution is limited to coastal areas or large lakes and rivers (Ehrlich et al. 1988). Ospreys nest at the tops of snags or live trees, usually over water or near water (Terres 1980). Ospreys are subject to piracy by bald eagles, and they are not usually found where bald eagles are common. In Alaska, osprey breeding distribution is limited to a few scattered pairs except for a cluster of 20 to 30 pairs near Tetlin Lake (Hughes 1985; Poole 1989). No real concentrations have been found in Southeast Alaska, although multiple pairs have been found at Thomas Bay and on Kupreanof Island. Both areas are relatively close (<20 miles) to the project area (Blatt 1994b).

No ospreys were observed during the field work in the Port Houghton/Cape Fanshaw vicinity. The habitat would appear to be suitable, with extensive coastline, numerous trees and snags close to the water, and abundant fish. However, there are many bald eagles in the vicinity, with nesting pairs about every ½ mile along the coastline.

<u>Marbled Murrelet</u> - The marbled murrelet (*Brachyramphus marmoratus*) was recently listed as a threatened species in Washington, Oregon, and California where dramatic population declines have occurred over the past several decades. Loss of old-growth forest nesting habitat, gill-net fishing, and oil spills have been implicated as the major threats to the survival of these populations (Stein and Miller 1992). In Alaska, marbled murrelets are still relatively abundant—Piatt and Ford (1993) recently estimated the Southeast Alaska breeding population at

96,200—although here the bird remains a Category 2 candidate for listing as threatened or endangered by the USFWS. As elsewhere, loss of nesting habitat due to timber harvest is perceived as a major threat to the continued health of this population.

Field surveys conducted in the project area occurred in summer 1994. Thirty-two proposed harvest units were surveyed for murrelets with detections recorded at 23 units (72 percent). Unit detections ranged between 0 and 107 birds with a total of 241 murrelets observed over all surveyed units. In addition, marbled murrelets were surveyed along six nearshore marine transects. The lowest densities occurred along the shoreline of Port Houghton, and the highest densities occurred in the protected waters of Sandborn Canal and Salt Chuck. The high-density estuarine areas (Sandborn Canal and Salt Chuck) provide good foraging habitat, and serve as travel corridor gateways to inland nesting stands.

Olive-sided Flycatcher - The olive-sided flycatcher (*Contopus borealis*) was recently declared a Category 2 candidate for listing as threatened or endangered largely because of population declines recorded throughout their range, but most especially in central Alaska. Causes for the perceived declines have not been determined, but deforestation in their Central and South American wintering ranges is a prime suspect. In the Pacific Northwest, the olive-sided flycatcher has been commonly associated with mature and old-growth forests (Brown 1985). However, observations by USDA-FS biologists in Alaska suggest they are more commonly associated here with edge habitats, especially near beaver ponds (Blatt 1995). These edge areas are protected as stream buffers.

Very little is presently known about the status of olive-sided flycatchers in Southeast Alaska. Both Taylor (1979) and Armstrong (1990) consider this species to be an uncommon breeder in this region. No olive-sided flycatchers were observed during field studies in the project area.

Gray Wolf - The Alexander Archipelago gray wolf has recently been added to the USFWS candidate list. The distribution of the gray wolf depends on the abundance and availability of prey, the presence of roads, and the competition for prey with other predators (Suring and DeGayner 1988). Preferred prey species are large ungulates such as Sitka black-tailed deer, moose, and mountain goat. Beaver (*Castor canadensis*) are also preyed on when larger mammals are not available. Human hunting of wolves may be a secondary limiting factor.

As a result of the wolf's dependency on populations of their prey species, the location and abundance of the wolf in the Port Houghton/Cape Fanshaw project area is dependent on the overall abundance of moose, deer, and mountain goat. Moose occur throughout the project area in low numbers (as observed from scat and tracks), most of the project area is unsuitable or unfavorable for deer, and mountain goat distribution is limited to high-elevation areas.

The habitat capability model for wolves estimates that nine wolves could occupy the area. Wolves were seen from aerial surveys and were heard at night during the marbled murrelet surveys. Observations were infrequent, but wolves were heard, seen, or scat observed during field investigations. A wolf den is located approximately 400 ft from a unit. Wolf sign and/or observations were additionally recorded at the Rabbit Cove LTF sites, on Washington Peak, on the shoreline of Port Houghton Salt Chuck, on Goldbelt, Inc. lands, and near proposed road 8491.

<u>North American Lynx</u> - The North American lynx (*Felis lynx canadensis*), a Category 2 candidate species, is a specialized predator that preys almost exclusively on snowshoe hares (More 1976, Koehler 1990). Population dynamics of lynx, especially in northern latitudes, are greatly influenced by dramatic changes in population densities of hares that occur on an approximate 10-year cycle. When snowshoe hares are scarce, lynx productivity and densities are low (Brand and Keith 1979; Koehler 1990). It is during these population ebbs that lynx are especially vulnerable to overexploitation and habitat disruption (Brand and Keith 1979; Bailey et al. 1986).

Like many carnivores, lynx prefer habitats where their prey is most abundant. In Alaska, lynx are most commonly found in boreal forests where they use both ends of the forest succession spectrum (Koehler and Brittell 1990). Lynx apparently prefer mature forests for denning and young-aged stands for foraging. Young-aged stands with a mix of hardwoods (forage) and conifers (cover) are apparently preferred by snowshoe hares (Wolff 1980).

Providing good foraging habitat for lynx is apparently not incompatible with most forest practices (Koehler and Brittell 1990). Prescribed burning, logging, and thinning can create the young-aged stands preferred by the lynx' principal prey. However, road building normally associated with timber activities can have a serious impact on lynx populations by increasing access to hunters and trappers, and disrupting lynx travel and hunting patterns (Koehler and Brittell 1990). Also, timber harvest layouts which do not leave mature forest areas for lynx to den can also impact local populations.

Apparently lynx do not prefer the temperate rainforest regions of Southeast Alaska (Banfield 1974; McCord and Cordoza 1982; Tumlison 1987), probably because of the lack of boreal forest and significant populations of snowshoe hares. Although the range of the snowshoe hare includes Southeast Alaska (Bittner and Rongstad 1982), they are typically found only in isolated populations at the mouths of major rivers from Canada (ADF&G 1977). The distribution of lynx on the mainland includes specimen and sight records at least 50 miles north and south of the project area. No evidence of lynx (or snowshoe hares) was observed by the wildlife team during field studies in the project vicinity, although a bobcat sighting near Farragut Bay was reported during public scoping. Since bobcats are not

known to occur on the mainland of Southeast Alaska, the animal likely observed was a lynx.

Marine Mammals

Whales and Dolphins

Humpback Whale (E) - The humpback whale, which is an endangered species protected under the Endangered Species Act (ESA), is also on the State of Alaska's Endangered Species list. Their population in the North Pacific is estimated to be between 1,113 and 1,701 animals; this is believed to be from 7 to 11 percent of pre-whaling numbers (Baker and Herman 1987). Humpback whales are the most abundant endangered whale that occur in Southeast Alaskan waters, and Baker et al. (1985) estimate that up to 300 to 350 individuals occur in summer and fall. Humpback whales feed in the summer, and migrate south of Southwest Alaska in the fall to mate and bear calves. Humpback whales are known to concentrate at the mouth of Port Houghton and in Stephen's Passage during the summer and fall (ADF&G 1994c). The Sitka Conservation Society indicated that Frederick Sound is an important humpback whale feeding area (public scoping comment letter dated October 31, 1994). Humpback whales were sighted 14 times in the Port Houghton area by the interdisciplinary team in June 1994, and sightings continued throughout the summer. It is not known if these were 14 different individuals or repeat sightings of the same individuals, although a group of 6 animals was sighted on June 11, 1994 southwest of Rabbit Island. A frequent turnover of humpback whales occurs because the whale distribution in the area is constantly changing (Baker and Herman 1987). Humpback whales in the Port Houghton area are presumably feeding on schools of Pacific sand lance (*Ammodytes hexapterus*) and herring that move into and through the area in spring and summer.

Minke Whale - The minke whale (*Balaenoptera acutorostrata*) is protected under the Marine Mammal Protection Act (MMPA) by the NMFS. The species is not considered to be abundant in the eastern Pacific Ocean, except in Alaskan waters. Minke whales are present in Alaskan waters primarily in the summer to feed and then migrate to sub-tropic areas in the winter to mate and bear calves. This species is both pelagic and common in bays and shallow coastal waters. They feed in the summer on a variety of schooling fish and zooplankton. Two sightings of minke whales occurred in the Port Houghton area during summer 1994.

Pacific White-sided Dolphin - Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) are protected under the MMPA. Although resident in some areas, Pacific white-sided dolphins shift seasonally northward and southward, or in some cases inshore and offshore, according to changes in water temperature. Their distribution and migration is limited to the North Pacific, and they are known to occur throughout the Gulf of Alaska. Little is known about their life history patterns and reproductive history. They prey on a variety of finfishes and squids. Two schools of dolphins were seen in the Port Houghton area.

Pinnipeds

Harbor Seal (S) - The harbor seal, protected under the MMPA, is listed as Species of Special Concern by the State of Alaska. The harbor seal is not considered to be a highly migratory species but it makes local seasonal movements in response to prey distribution. The population is considered to be stable throughout most of its range but is declining at some sites (i.e., Muir Inlet) in Alaska (Sease 1992). Comprehensive counts of harbor seals in Southeast Alaska indicated that about 7,000 to 10,000 animals occurred in the Glacier Bay area, and near Sitka and Ketchikan in the 1980s. Recent (1993) surveys of harbor seals in Southeast Alaska from Dixon Entrance to Icy Cape indicate a maximum count of 22,447 animals (Loughlin 1994).

A number of harbor seal haul-out sites are within the Port Houghton/Cape Fanshaw project area. Harbor seal haul-out sites occur on an island in the Salt Chuck, at the mouth of Sandborn Canal, on Rabbit and Walter islands, at the mouth of Port Houghton at Robert and Foot islands, south of the mouth of Port Houghton in Steamboat Bay, and northeast of the South Arm of Farragut Bay at Francis Anchorage (ADF&G 1994c).

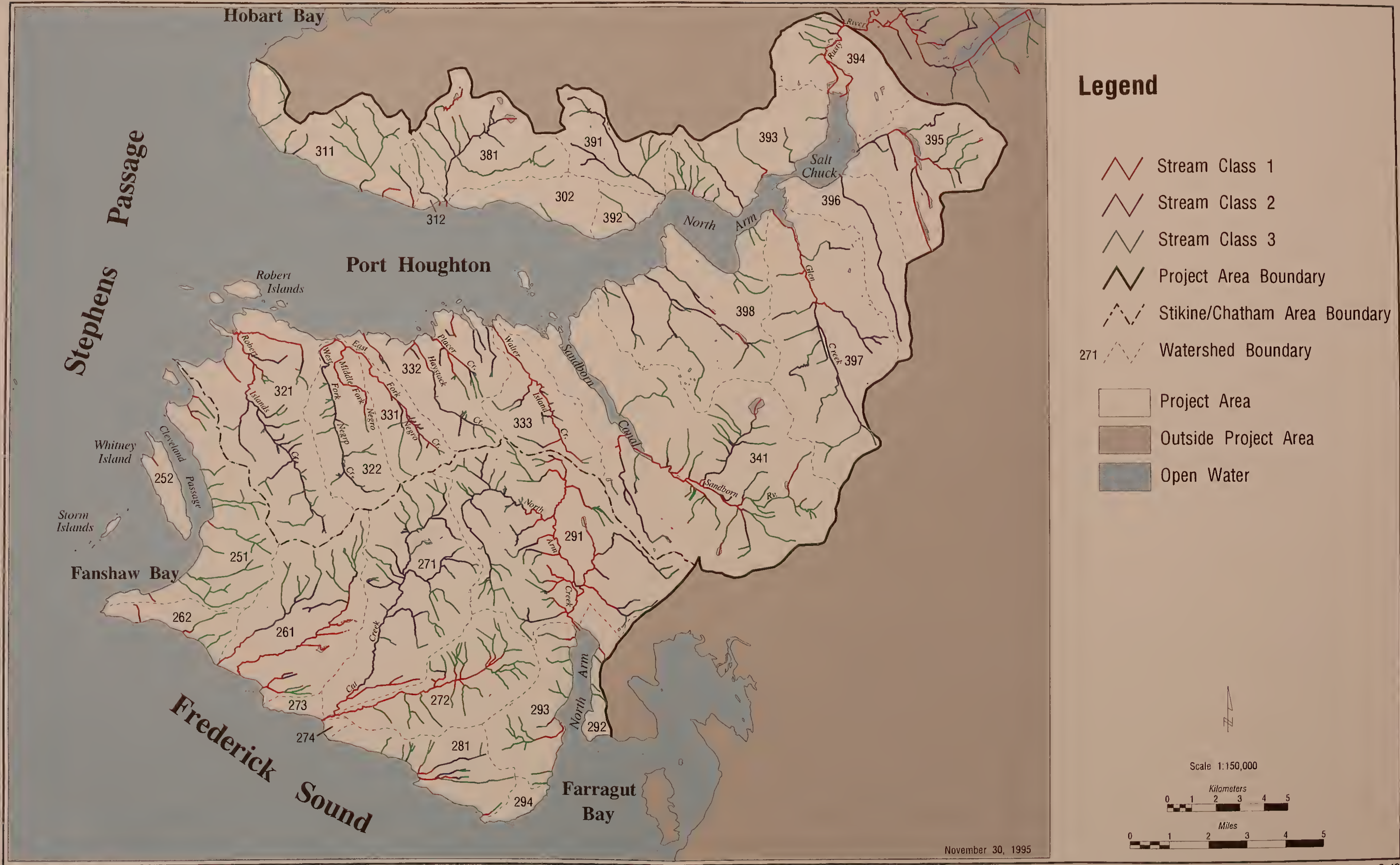
Steller Sea Lion (T, S) - The Steller sea lion is a federally listed threatened species protected under the ESA, and listed as a Species of Special Concern by the State of Alaska. The distribution and migration of the Steller sea lion is limited to the North Pacific Ocean. The species ranges from southern California north through the Gulf of Alaska, the Bering Sea, and the Aleutian Islands. Population surveys since 1990 indicate a continuing population decline, and modelling efforts by NMFS indicate that if the decline continues, the Steller sea lion population could be reduced to levels approaching extinction within 100 years (NMFS 1994). The species typically inhabits exposed coastal areas in summer and moves to more protected inland passages and bays in winter (Arndt et al. 1987). Sunset Island, located in Stephens Passage, is the closest federally designated critical habitat to the Port Houghton/Cape Fanshaw project area (ADF&G, personal communication 1994). Another closer haul out is Sail Island located 8 miles west of the entrance to Port Houghton. Other Steller sea lion haul out and concentration areas occur northwest of Frederick Sound on The Brothers and Round islands, in Farragut Bay, and along the shoreline north of Cape Fanshaw, and west of Sandborn Canal. As many as 200 sea lions have been reported in the Port Houghton Salt Chuck during the summer months; they are believed to feed on the sockeye salmon run in Rusty River (ADF&G 1994c).

Fish and Water Quality (Issue 6)

The project area is divided into 31 major watersheds as shown on Figure 3-4. Some of these watersheds incorporate several small adjacent watersheds (i.e., separate and distinct drainage areas) to facilitate the evaluations. For reference,

Figure 3-4

Stream Classification in the Port Houghton/Cape Fanshaw Project Area



each of these watersheds is assigned a three digit number. The unit pool identifies potential timber harvest units in the drainages of 18 streams located in 13 of the 31 major watersheds. Detailed intensive stream surveys were not conducted in watersheds where timber harvesting and road construction are not proposed under any alternatives (e.g., the Rusty River and Glen Creek watersheds at Port Houghton Salt Chuck). The Rusty River and Glen Creek watersheds were not included in the unit pool, in part, due to their importance for salmon production, including sockeye and possibly chinook salmon.

Revisions to the existing geographic information system (GIS) data, based on field investigations, resulted in identifying 87 miles of Class I (anadromous fish such as coho salmon) streams, 124 miles of Class II (resident fish such as cutthroat trout) streams, and 200 miles of Class III (no fish) streams within the project area (Table 3-12). Channel type GIS data were similarly updated, resulting in nine of the ten Tongass National Forest channel-type process groups being represented (all except Glacial Outwash). Process groups are categories of stream channel types that are similar in the interrelationships between watershed runoff, landform relief, geology, and glacial or tidal influences on stream erosion and deposition. Most stream miles (i.e., 254 miles) in the project area are in the High Gradient Contained (HC) process group, predominantly deeply incised mountainslope channels. Other common channel-type process groups are Moderate Gradient Mixed Control (MM), Moderate Gradient Contained (MC), and Floodplain (FP). The distribution of stream miles among process groups is similar in the project area to that reported for mapped channels throughout the Tongass National Forest (Paustian et al. 1992).

Stream reach inventories and channel stability evaluations (SRI/CSEs) resulted in 76 stream reaches that are rated as "good," 89 reaches that are rated as "fair," and four reaches that are rated as "poor." These ratings indicate the resistance of the stream channels and banks to hydraulic forces and the capacity of the stream to adjust and recover from potential changes in stream flow and/or increases in sediment production. The watershed determined to be the most sensitive by the SRI/CSE procedure is the East Fork Negro Creek (Watershed 331).

Alaska Water Quality Standards establish maximum stream temperatures between 55.4 and 59 °F for growth and propagation of fish, shellfish, and other aquatic life and wildlife. Temperatures should not exceed 68 °F at any time. Stream water temperatures recorded by field personnel within or near potential timber harvest units ranged from 46 to 60 °F. These measurements were taken under a variety of weather conditions during different times of day throughout the June to September 1994 field season. Water temperatures exceeding 58° F were measured only in the Sandborn River watershed. Only in the East Fork Negro Creek and Walter Island Creek watersheds were there no water temperatures exceeding 55.4° F, during summer 1994. Most of the streams in the project area are used by resident fish, primarily cutthroat trout. Several species of anadromous

Table 3-12

Area, Stream Density, and Stream Length By Stream Class in the Port Houghton/Cape Fanshaw Project Area

Watershed	Stream Name(s)	Watershed Area (acres)	Watershed Area (sq. mi.)	Total Stream Length (miles)	Stream Density	Stream Length by Class: Class I	Class II	Class III
251	Unnamed Creeks	5,363	8.4	17.1	2.0	1.2	0.2	15.7
252	Whitney Island Creek	862	1.3	0.3	0.2	0.3	0.0	0.0
261	Unnamed Creeks	6,987	10.9	24.3	2.2	9.2	5.3	9.7
262	Unnamed Creeks	1,495	2.3	3.2	1.4	0.9	0.0	2.3
271	Cat Creek	8,666	13.5	33.1	2.4	3.7	15.9	13.5
272	South Fork Cat Creek	5,171	8.1	23.4	2.9	7.7	0.3	15.4
281	Unnamed Creeks	3,267	5.1	10.4	2.0	1.9	2.4	6.0
291	North Arm Creek	12,238	19.1	51.2	2.7	15.8	16.1	19.3
292	Unnamed Creeks	1,001	1.6	1.5	1.0	0.2	1.3	0.0
293	Unnamed Creeks	3,349	5.2	9.1	1.7	1.5	0.0	7.6
302	Unnamed Creek	2,027	3.2	0.6	0.2	0.0	0.0	0.6
311	Unnamed Creeks #1-6	4,880	7.6	13.0	1.7	1.1	1.2	10.7
312	Unnamed Creek #1	567	0.9	2.0	2.2	0.0	0.6	1.4
321	Robert Islands Creek and Unnamed Creek #1	8,338	13.0	24.9	1.9	5.1	11.6	8.2
322	West Fork Negro Creek	4,065	6.4	14.2	2.2	3.8	5.2	5.2
331	East Fork Negro Creek	2,276	3.6	8.3	2.3	3.5	2.3	2.5
332	Haystack and Placer Creeks and Unnamed Creeks #1-6	5,017	7.8	17.6	2.2	4.7	8.6	4.3
333	Walter Island Creek	3,527	5.5	10.0	1.8	5.4	2.1	2.5
341	Sandborn Creek and Unnamed Creeks #1-3	17,291	27.0	40.9	1.5	6.4	9.6	24.9
381	Unnamed Creeks #1	4,825	7.5	15.4	2.0	1.4	5.8	8.3
391	Unnamed Creek	3,050	4.8	9.7	2.0	0.0	5.6	4.1
392	Unnamed Creek	1,034	1.6	1.4	0.9	0.0	0.4	1.0
393	Unnamed Creek	4,977	7.8	11.7	1.5	0.6	2.4	8.7
394	Rusty River	4,035	6.3	7.5	1.2	4.1	0.3	3.1
395	Unnamed Creek	5,748	9.0	15.3	1.7	5.2	5.0	5.0
396	Unnamed Creek	3,568	5.6	4.9	0.9	0.0	4.9	0.0
397	Glen Creek	10,060	15.7	21.2	1.4	2.9	10.5	8.0
398	Unnamed Creeks #1-9	8,335	13.0	18.8	1.4	0.5	6.9	11.4
	TOTALS	**142,019**	**221.8**	**411.0**	**1.7 (Avg.)**	**87.1**	**124.5**	**199.4**

Source: Good 1995a

fish are present in major streams and the lower reaches of numerous small streams. ADF&G peak escapement surveys of the Sandborn River indicate pink salmon (*Oncorhynchus gorbuscha*) production has ranged up to 105,000 fish, with lesser numbers of chum salmon (*Oncorhynchus keta*), coho salmon (*Oncorhynchus kisutch*), and sockeye salmon (ADF&G 1994d). Steelhead trout are also known to use the river. Other highly productive salmon streams in the project area are Negro and Robert Islands creeks. ADF&G data indicate Haystack Creek, Placer Creek, and Walters Island Creek are among other streams used by pink salmon and chum salmon.

Fish and water resource data and field observations for the 13 watersheds containing potential harvest units are summarized in the following sections.

Watershed 261 Unnamed Creeks

Watershed 261 is located in the southwest corner of the project area within the Stikine Area. The largest of three third-order streams is located in the center of the watershed and drains tributaries where adjacent potential timber harvest units are located. These tributaries are high-gradient contained-channels that drain steep hillsides in the northern corner of the watershed. These Class III streams feed into Class II streams at lower elevations. The three primary drainages run directly to saltwater providing more than five miles of Class I streams and more than nine miles of Class II streams. One reach survey was conducted in a Class III tributary in the headwaters of the largest unnamed stream in the watershed. The water was clear, and evidence of natural sedimentation was minimal.

Cutthroat trout were observed in Class II streams in the northern corner of the watershed near potential timber harvest units. No anadromous fish escapement data are available for this watershed (ADF&G 1994d). Some V-notch channels are present on steeper slopes in the headwaters (i.e., northern corner) of the watershed. Evidence of past slope failures are apparent and are a common characteristic in areas of high-gradient, deeply incised channel types. Downstream channels are generally stable.

Watershed 271 Cat Creek

Watershed 271 is located on the Stikine side of the project area. Cat Creek is a relatively large (i.e., fifth order) Class I stream branching into several Class II and III tributaries in the northern portion of the watershed where the proposed harvest units are located. Tributaries in the northwest portion of the watershed drain steep slopes and are predominantly of the high-gradient contained-channel type process group. These tributaries drain into moderate-gradient Class I and II streams. Streams in the eastern portion of the watershed are moderate in gradient.

A series of large waterfalls and cascades approximately one mile upstream from the mouth of Cat Creek prevent anadromous fish migration to an additional 15 miles of suitable habitat upstream. Fish passage enhancement was judged to be infeasible under any of the management alternatives. Further evaluation in the future would be needed to determine these barriers as an enhancement project.

The shallow banks adjacent to Class I and II streams are bordered by wide floodplains. These floodplains contain numerous small meandering channels with pools that provide suitable rearing habitat for salmonid fish. Cutthroat trout occur in the upper reaches of two Class II streams located in the northwest corner of the watershed.

Channel substrate was generally comprised of 20 percent or less in the sand and finer particles, and embeddedness was no more than 25 percent at any reach survey location, indicating that natural sedimentation rates are relatively low near proposed harvest units.

Watershed 291 North Arm Creek

Watershed 291 is the largest watershed on the Stikine side of the project area. North Arm Creek, a fourth-order stream, extends approximately 0.25 mile upstream from the estuary as a Class I stream before two waterfall barriers block anadromous fish migration. Fish pass construction has the potential to open an additional 15 miles of Class I habitat to anadromous fish. Class II streams extend for approximately 16 miles.

Two large waterfall barriers approximately one-quarter mile upstream from the mouth of North Arm Creek prevent fish passage to more than 15 miles of habitat suitable for anadromous fish use. Because of the close access to the barrier site from Farragut Bay, there is a potential for anadromous fish habitat enhancement.

The watershed's extensive network of streams provides several miles of excellent fish habitat, including the middle and upper reaches of the west branch. However, numerous cascades and waterfalls in the lower reaches of the west branch prevent this area from being opened to anadromous fish. Blasting steps in the lower falls on the main stem of North Arm Creek or creating a fish ladder by other means may be an opportunity to open several miles of habitat on the main creek and lower tributaries to anadromous use. No anadromous fish escapement data are available for this watershed (ADF&G 1994d).

Channel and bank stability varies within the watershed. Tributaries in the northwest portion of the watershed, where the terrain is steep, have deeply incised V-notch characteristics. Bank failures and undercutting were observed in these areas. Stream reaches in the central and eastern portions of the watershed are not as deeply incised, and exhibit less evidence of bank failures. The relatively stable channels and banks of the larger streams in the watershed are primarily comprised of large angular boulders and cobbles. The percentages of fines (i.e., silt and clay particles) and sand, and embeddedness vary widely for surveyed reaches within the watershed. This suggests that natural sedimentation is occurring near some proposed harvest units.

Watershed 311 Unnamed Creeks

Watershed 311 is located near the western portion of Goldbelt, Inc. land near the mouth of Port Houghton. For the EIS analysis, harvest has been assumed to

occur on all Goldbelt, Inc. land as a pre-existing condition, although harvest is not scheduled to be completed until 1997. However, the proposed timber sale project described in this EIS would not occur until after 1997.

The watershed includes several small first-order streams and one second-order stream that drain directly into saltwater, in addition to the main third-order stream. All of the proposed timber harvest units in this watershed are located in the drainage of the third-order stream. Waterfalls that are prevalent in this area prevent the migration of anadromous fish in all but the lower reaches of streams. A bedrock cascade approximately 200 yds upstream from the mouth prevents further upstream migration of anadromous fish. Because no fish were observed, and numerous permanent barriers exist within and downstream of the project area, all streams within Watershed 311 and upstream from barriers are designated Class III. No anadromous fish escapement data are available for this watershed (ADF&G 1994d).

The streams in the watershed are incised to bedrock, with numerous waterfalls. The upper banks are predominantly long steep slopes with limited vegetation. Bedrock forms stable stream banks along many stream reaches, but where soils overly the bedrock, evidence of slope failure is common.

Watershed 312 Unnamed Creeks

Watershed 312 is located on the north slopes of Port Houghton and is predominantly owned by Goldbelt, Inc. All Goldbelt, Inc. land has been presumed harvested under existing conditions. This 567-acre watershed rises from sea level to 2,300 ft. One two-mile-long first-order stream flows through the middle of the watershed. Most of the stream is Class III high-gradient contained-channels. However, there is a Class II section of alluvial fan and moderate-gradient mixed-control channels that provide 0.6 mile of resident fish habitat. The only management activities proposed in Watershed 312 are two helicopter logging units in the Class III headwaters area that total 36 acres.

Watershed 321 Robert Islands Creek

Watershed 321 is located north of Cape Fanshaw on the Chatham side of the project area. Water is transported from the watershed in three primary streams that flow directly into saltwater: North Fork Robert Islands Creek, the main fork of Robert Islands Creek, and a small unnamed stream.

The tributaries in the headwaters of North Fork Robert Islands Creek drain high-gradient slopes. These streams are generally Class III high-gradient contained-channel types within deeply incised V-notched canyons. The main stem between 100 and 500 ft elevation is also classified as a high-gradient contained-channel type. Stream gradients greater than 15 percent and the presence of waterfalls limit anadromous fish passage above the 100 ft elevation in the Class II reaches of North Fork Robert Islands Creek. The portion of the stream below 100 ft elevation is low-gradient Class I with a gravel-dominated substrate.

The upper reaches of the main stem of Robert Islands Creek are high-gradient contained-channels with both temporary and permanent fish passage barriers. Steep slopes in this area are drained by high-gradient, deeply incised Class II and III tributaries that flow into a deeply incised moderate-gradient main channel. The Class II streams are separated from the Class I downstream waters by a series of waterfalls occurring at approximately 300 ft elevation. Below these falls, the channel has a lower gradient and is not as contained by valley slopes.

The Class I reaches of both the North Fork and main Robert Islands creeks provide approximately five miles of accessible riffle/pool habitat with abundant spawning gravel. There are also several miles of high-quality habitat for resident trout upstream from passage barriers. The percentages of fines and sand at Watershed 321 reach survey locations ranged from 0 to 50 percent, and embeddedness ranged from 5 to 90 percent indicating that natural sedimentation may limit fish productivity in some areas of the watershed. ADF&G peak escapement surveys identified from 50 to 20,400 pink salmon between 1964 and 1994, with numbers greater than or equal to 10,000 each of the past six years (ADF&G 1994d). Chum peak escapement has ranged from 50 to 1,700 between 1968 and 1993, and coho are also produced.

Watershed 322 West and Middle Forks of Negro Creek

Watershed 322 is located immediately east of Watershed 321. This 4,065-acre area is drained by the West and Middle Forks of Negro Creek. To be consistent with the VCU boundary, the boundary of Watershed 322 was drawn to include nearly one mile of the lower East Fork Negro Creek.

West Fork Negro Creek, a third-order stream, is the larger of the two drainages. It flows the length of the watershed from south to north providing approximately five miles of Class II and one-half mile of Class I habitat. The headwaters of the creek are characterized as Class III, high-gradient narrow-channel types that are incised to bedrock. Falls and steep cascades are common along the main channel. Several large barriers, including a 30-ft waterfall less than one mile from its mouth, limit access by anadromous fish. The main channel is fed by moderate- to high-gradient shallow creeks that drain upland muskeg areas. As the West Fork flows north, its gradient becomes moderate. The lower reaches of West Fork Negro Creek meander in a wide floodplain through muskeg lowlands before reaching its mouth. Windfall and debris jams are present, but not as common as in the upper regions.

Middle Fork Negro Creek, a first-order stream, provides over three miles of Class I anadromous fish habitat. The lower reaches of the Middle Fork are of the moderate-gradient contained-channel types, the middle reaches are floodplain channels, and the upper reaches are moderate- to high-gradient contained-channel types.

Coho salmon and Dolly Varden trout (*Salvelinus malma*) were observed in the lower Class I reaches of both the West and Middle Forks of Negro Creek. As the

gradient increases and minor barriers appear, suitable spawning and rearing habitat for coho salmon also declines. Small low-gradient tributaries draining adjacent muskeg areas provide additional rearing areas. The upper reaches of the West Fork offer moderately productive habitat for Dolly Varden and cutthroat trout. ADF&G peak escapement surveys for the entire Negro Creek system are summarized for Watershed 331.

The percentages of fines and sand at the West Fork Negro Creek watershed reach survey locations ranged from 0 to 89 percent, and embeddedness ranged from 10 to 90 percent, indicating natural sedimentation may limit fish productivity in some areas of the watershed. The degree of sedimentation at the three reach survey locations on the Middle Fork Negro Creek were much less than that observed at the West Fork. Embeddedness ranged from 5 to 10 percent and the combined percentage of fines and sand in the substrate was zero at all three locations.

Watershed 331 East Fork Negro Creek

Watershed 331 is drained by the East Fork Negro Creek, the largest of the three Negro Creek forks. To be consistent with the VCU boundary, the boundary of Watershed 322 was drawn to exclude nearly one mile of the lower East Fork Negro Creek. Most of the 2.75 miles of Class I fish habitat in the East Fork from its mouth upstream to a 6-ft waterfall barrier, at an elevation of approximately 800 ft, are within the boundaries of Watershed 322. Nearly 3.5 miles of additional Class I habitat lie above the barrier. In 1986, the Forest Service initiated construction of a fishpass at this site. To date, this project has not resulted in coho salmon utilization of the habitat above the barrier. Additional work at the site is expected to result in successful completion of the project.

The East Fork has two major tributaries that drain most of Watershed 331. The headwaters are high-gradient contained-channel types. These channels are relatively straight and show evidence of substantial mass wasting, bank cutting, pool filling, and deposition. Small temporary barriers are common where logs or boulders become lodged and trap gravel and debris. The middle reaches between 500 and 800 ft elevation are generally more moderate in gradient. The lower reaches of East Fork Negro Creek meander through shallow-gradient muskeg lowlands. Tributaries of the upper watershed are generally high-gradient contained streams. Tributaries of the lower East Fork Negro Creek are generally low-gradient palustrine streams.

The lower East Fork Negro Creek provides suitable habitat for the spawning and rearing of anadromous fish. The tributaries meandering through muskegs adjacent to the main channel provide additional rearing habitat. The percentages of fines and sand at the East Fork Negro Creek watershed reach survey locations ranged from less than 10 to 50 percent, and embeddedness ranged from 30 to 70 percent, indicating natural sedimentation may limit resident fish productivity in the upper reaches of the watershed. ADF&G peak escapement surveys indicate pink salmon production for the entire Negro Creek drainage has ranged from 650 to 40,000

fish between 1962 and 1994, with numbers greater than or equal to 15,000 each of the past three years (ADF&G 1994d). Chum peak escapement has ranged from 6 to 2,800 between 1968 and 1993 (2,800 in 1993), and coho also are produced. Peak escapement data are not separated for the three forks of Negro Creek included in watersheds 322 and 331.

Watershed 332 Haystack Creek, Placer Creek and Unnamed Creeks

Watershed 332 is centrally located in the project area. This 5,017-acre watershed is a combination of eight first- to third-order drainages that enter Port Houghton between Negro Creek and Walter Island Creek. Most of Watershed 332 is drained by Haystack Creek, the longest of the streams, and Placer Creek. Five of the six smaller creeks are previously unmapped streams that were located during field reconnaissance, two of which flow into Little Lagoon, a proposed LTF site.

Watershed 332 streams provide 4.7 miles of Class I habitat, 8.6 miles of Class II, and 4.3 miles of Class III. Generally, the upper reaches of each drainage are high-gradient contained-channel types, the middle reaches are moderate-gradient contained, and the lower reaches are low-gradient meandering floodplain channels adjacent to muskeg areas. A landslide approximately one mile upstream from the mouth of Haystack Creek blocks fish passage, and habitat for anadromous fish upstream from the barrier is limited. The small tributaries of the upper reaches of the watershed generally have high-gradient, deeply incised, straight channels. The small tributaries of the lower watershed are low-gradient, meandering palustrine and floodplain channels. Removal of a minor log jam barrier on a tributary of lower Placer Creek would open approximately 1,000 ft of suitable anadromous fish habitat.

Favorable habitat for anadromous fish occurs in the lower to middle reaches of most streams in the watershed, particularly the moderate-gradient contained or mixed-control channel types. Evidence of natural sedimentation was more prevalent in Placer Creek, Little Lagoon, and other streams in the watershed compared to Haystack Creek.

ADF&G peak salmon escapement survey data are available for three streams within Watershed 332 (ADF&G 1994d). Estimates for Haystack Creek (referred to in the survey as the 1st west of Negro Creek) range from 200 to 6,700 pink salmon annually between 1970 and 1994. The peak count for chum salmon is only available for two years: 137 in 1972 and 4 in 1982. Estimates for Placer Creek pink salmon range from 100 to 7,000 fish annually between 1968 and 1994. Data were also available for one of the unnamed streams, referred to as 2nd west of Sandborn Canal, ranging from 100 to 2,000 pink salmon annually between 1975 and 1994.

Stream stability is of concern, primarily in the upper reaches of Haystack Creek and Placer Creek where slopes are steep. Evidence of slope failures are common in the lower reaches of these tributaries and in the main channels where steep side

slopes are undercut and collapse during high flows. Channels in the lower portion of the watershed are low-gradient and not as contained by valley slopes. These channels experience occasional flooding and moderate cutting and pool filling, but they are generally much more stable than the upstream reaches.

Watershed 333 Walter Island Creek

Watershed 333 lies west of Sandborn Canal. This watershed has a unique feature for the Chatham side of the project area: a wide muskeg valley that extends nearly its entire length. Walter Island Creek and its tributaries provide 5.4 miles of Class I habitat. Walter Island Creek has a low-gradient meandering channel with a predominantly fine sand substrate. The bank vegetation exhibits evidence of frequent flooding, and abundant large woody debris provides instream cover. Near Port Houghton, the gradient increases and the channel flows in a straight course to its mouth. Tributaries on both sides of the main channel offer additional fish habitat in their lower reaches, but have boulder and bedrock waterfalls in their upper reaches that limit fish migration.

This stream system provides 5.4 miles of highly productive Class I spawning and rearing habitat. Spawning pink salmon were observed during field surveys. Many of the lower reaches of tributaries are accessible to anadromous fish during low- as well as high-water conditions. ADF&G peak escapement surveys indicate pink salmon production has ranged from 70 to 3,000 fish between 1968 and 1994, with the greatest number occurring in 1994 (ADF&G 1994d). Chum peak escapement data are only available for 1993 when the peak count was 100.

Streams in this watershed generally exhibit greater bank and channel stability relative to other drainages in the project area. The main channel of Walter Island Creek experiences moderate cutting and pool filling, and appears to be in equilibrium with respect to erosion and deposition. The degree of natural sedimentation is highly variable. High-gradient reaches have virtually no fines or sand and zero percent embeddedness. More typically, the main channel is dominated by up to 90 percent sand substrate, and is 90 percent embedded where it meanders through a broad muskeg floodplain. Similarly, the substrate composition and embeddedness in tributaries is highly variable and reflects areas of channel cutting and sediment deposition. The water in many muskeg channels is brown.

Watershed 341 Sandborn Canal

Watershed 341 is the largest watershed in the project area, encompassing 17,291 acres. The Sandborn River and its tributaries provide important spawning and rearing habitat for anadromous fish. The watershed ranges in elevation from sea level at Sandborn Canal to 4,000 ft at its highest point. Four streams drain into Sandborn Canal, including Sandborn River, a large third-order stream at the head of the canal. Two additional second-order streams flow north into the head of the canal and one high-gradient second-order stream enters the central part of the canal from the east.

Sandborn River and its tributaries provide approximately four miles of highly productive Class I anadromous fish habitat. The lower reaches are low-gradient estuarine and floodplain channels that meander through adjacent grasses and muskegs. Within the estuary, Sandborn River is braided into two or more channels separated by islands. Numerous small first-order tributaries within the estuary provide excellent rearing habitat for juvenile coho salmon. There is also a second-order tributary with nearly one mile of Class I habitat that enters Sandborn River in the estuary. Upstream from the estuary, the Sandborn River has two main forks with low-gradient floodplain Class I habitat in the lower reaches. Multiple high-waterfall barriers and steep gradients in the middle and upper watershed limit opportunities for enhancing anadromous fish use.

The East Fork of Sandborn River drains a lake at approximately 2,300 ft elevation. A 60-ft waterfall is located immediately below the lake. The central reaches of the stream are fed by several Class III streams that generally exhibit high-gradient, moderately to deeply incised channel types. The stream follows a high-gradient Class III channel until it becomes wider and less steep near the confluence with the South Fork. Many waterfall and cascade barriers occur along this fork making it inaccessible to migrating anadromous fish. Embeddedness is highest (60 percent) in the lower reaches of the East Fork and tributaries of the lower Sandborn River. These lower tributaries drain relatively unstable slopes that have naturally high rates of erosion and sedimentation.

The South Fork of Sandborn River has two major branches, each of which has a lake in its headwaters. The north branch of the South Fork is a high-gradient, deeply incised channel that has numerous fish passage barriers. No harvest units are proposed along this branch. The south branch of the South Fork is a high-gradient contained-channel type that is also inaccessible to anadromous fish, except in the lower reaches.

Lower Sandborn River is one of the most productive anadromous fish streams in the project area, second only to the Rusty River. Pink salmon were observed in late summer, returning to spawn in the lower reaches. ADF&G peak escapement surveys indicate pink salmon production has ranged from 1,030 to 105,000 fish between 1960 and 1994, with annual peak counts exceeding 14,000 every year since 1978 (ADF&G 1994d). Chum peak escapement data have ranged from 50 to 26,000 between 1960 and 1994. Coho salmon (500 in 1981 peak escapement survey) and Dolly Varden are also produced, and 1 to 5 sockeye salmon were reported in the 1978 and 1977 surveys. The State's anadromous stream catalogue indicates the Sandborn River contains steelhead (ADF&G 1993), and the USDA-FS observed one mature adult steelhead (*Salmo gairdneri*) in the lower river in the spring of 1994 (Martin 1994).

The upper reaches of Sandborn River and its tributaries provide limited fish habitat for resident trout. These reaches typically have high-gradient channels

with numerous waterfall and cascade barriers that limit fish migration. Evidence of erosion and slope failures is common.

An opportunity for anadromous fish habitat enhancement exists on an unnamed stream that flows into Sandborn Canal from the west (Unnamed Creek #1). Removal of a large debris jam located 190 yds upstream from the estuary would open approximately 1,600 ft of habitat upstream, including suitable spawning areas for pink salmon.

Watershed 381 Unnamed Creek

Watershed 381 is drained by a third-order stream that has three major forks. Several lakes are located in the headwaters of the middle and north forks, including Alice Lake. The three forks converge in the center of the watershed on Goldbelt, Inc. land. This 4,825-acre watershed ranges in elevation from sea level to 4,000 ft, and includes some of the steepest terrain in the project area.

The three main forks of the unnamed creek drop 2,000 ft in elevation in approximately three miles. Much of this elevation drop is by waterfalls. These natural barriers prevent fish from migrating upstream through the Goldbelt, Inc. lands to the project area. The first high waterfall is only 100 yds from the estuary. No fish were observed in the project area portion of the watershed, thus all streams in the vicinity of proposed logging units were judged to be Class III. Channels are commonly cut to bedrock with loose cobbles and boulders that indicate frequent scouring and deposition. The upper reaches of streams in the watershed have relatively stable channels and banks comprised primarily of bedrock, large cobbles, and boulders. The lower reaches of streams in the watershed are deeply incised and have extremely steep banks with high potential for erosion and mass wasting. No anadromous fish escapement data were available for this watershed (ADF&G 1994d).

Watershed 398 Unnamed Creek

Watershed 398 is located east of Sandborn Canal and southwest of North Point. Water is drained from the area by nine unnamed creeks that flow into Port Houghton and its North Arm: one third-order stream, three second-order streams, and five first-order streams. Stream reaches of the watershed are predominantly high-gradient contained-channel types with many steep cascades and waterfalls. These conditions prevent access by anadromous fish. However, due to the presence of resident cutthroat trout in upper reaches of the third-order stream, it is designated Class II.

Anadromous fish have access only to short reaches at the mouth of the streams. Resident cutthroat trout were observed in the upper reaches of the west fork of the largest drainage. No anadromous fish escapement data were available for this watershed (ADF&G 1994d).

Stream channels in the upper reaches of the watershed are commonly incised to bedrock and are thus relatively stable. The channels in lower reaches of the

watershed are less stable, as evidenced by recent deposition behind log and debris jams. Stream banks in many reaches throughout the watershed exhibit evidence of moderate mass wasting of the upper banks and stream cutting of the lower banks. As would be expected in high-gradient channels, the combined percentages of sand and finer particles was relatively low (0 to 25 percent), indicating that sedimentation is minimal.

Physical Resources (Issue 7)

Geology and Minerals

There are no active mining claims within the Port Houghton/Cape Fanshaw project area according to the records of the U.S. Bureau of Land Management (USBLM) and U.S. Bureau of Mines (USBOM). Three former mining claim areas and known exploration prospects occur within the project area (Figure 3-5 and Table 3-13).

Table 3-13

Three Former Mining Claim Areas and Known Exploration Prospects within the Port Houghton/Cape Fanshaw Project Area

MAS #	Name	Commodity	Type	Operation
0021150005	The Islander	Gold	Exploration	Prospect
0021150037	Port Houghton	Stone	Past	Producer
0021150011	Louise Group	Copper	Exploration	Prospect

Source: Morton 1995a

Locatable minerals include metallic minerals (gold, copper, lead, etc.) and some varieties of non-metallic minerals (asbestos, mica, etc.). A review of the mineral assessment information, regional and site-specific geology, known mineral occurrences, and mining claims records in the Port Houghton/Cape Fanshaw project area indicates mineralization and mineral-bearing rocks are present, but limited known mineral potential data are available. Gold, copper, silver, and zinc are the primary metals discovered in the exploration prospect areas. Specific areas of high value/high development potential and locatable mineral deposits have not been identified within the project area. According to published geology and mineral potential reports (Brew et al. 1991; Coldwell 1989; and Berg 1984) rock units exist in the project area with the potential to contain epigenic vein, disseminated, and massive sulfide deposits. Berg (1984) judged the Cape Fanshaw area as possibly favorable for disseminated sulfide deposits, and the eastern portion of the project area to be possibly favorable for stratiform massive sulfide deposits.

Figure 3-5

Geologic Units and Mineral Resource Locations

DEFINITION OF GEOLOGIC MAP UNITS

Stratified Rock Units (may include metamorphosed and/or deformed rocks)

- KJs Sedimentary Rocks (Cretaceous to Jurassic age)
- KJv Volcanic Rocks (Cretaceous to Jurassic age)

Undivided Stratified and/or Metamorphosed and/or Deformed Rocks

- KPs Sedimentary Rocks (Cretaceous to Permian age)
- KPv Volcanic Rocks (Cretaceous to Permian age)
- KPsv Sedimentary and Volcanic Rocks, Undivided (Cretaceous to Permian age)

Intrusive Igneous Rocks (may include metamorphosed and/or deformed rocks)

- TKt Tonalite (Paleocene to Cretaceous age)
- Kgt Granodiorite and Tonalite (Cretaceous age)

Known Prospect, Claim or Producer

- ◐ Prospect
- ▲ Lode Claim
- ◆ Producer

(1) Port Houghton Copper Prospect (Berg 1984)
(2) Louis Group Prospect (USBOM MAS 1994)
(3) The Islander Prospect (Berg 1984)
(4) Port Houghton Stone Producer (USBOM MAS 1994)
(5) Former Trap Line #1 & #2 Lode Claims (USBLM IRM 1994)
(6) Former Hecla Mining Co. Lode Claim (USBLM IRM 1994)
(7) Former Davidson Lode Claim (USBLM IRM 1994)

Map Symbols

- Project Area Boundary
- Contact -- Approximately located; dotted where concealed; dashed where inferred.
- Fault -- Dashed where approximately located or where interpreted; dotted where concealed. Arrows indicate sense of strike-up displacement.
- Coast Range megalineament -- Topographic and structural lineament (as described by Brew and Ford, 1978).

Base map modified from Gehrels, G.E. and Berg H.C. 1992. Geologic Map of Southeastern Alaska. U.S. Geological Survey, Map I-1867.

The USBLM and USBOM state that there is no current information indicating that the project area contains valuable leasable mineral occurrences (such as oil, gas, oil shale, potassium and sodium-bearing minerals, geothermal resources, and coal). One stone producer (Port Houghton producer, Figure 3-5) is present in the project area. Salable minerals appear to be available and may be locally valuable as road-building material for the proposed timber harvest.

Karst Features

During field surveys for this project, an effort was made to examine rock types for karst features, wherever possible. In most forest and muskeg areas, the soil layers are too thick to allow easy observation of the underlying rocks. However, rocks are exposed on some steep slopes, in stream channels, and along the shoreline. Most rocks observed or specimens collected within the project area are metamorphic, including slate, schist, mica schist, phyllite, quartzite, serpentinite, and gneiss. A few granite specimens and one sandstone sample were collected.

No soluble rocks (limestone, dolomite, gypsum, or others) were found at any location, and there is no evidence of karst development or caves anywhere within the project boundaries. Likewise, there are no recent basalt flows that could contain lava caves, and there is no indication of sea cave development along the shoreline of Port Houghton.

Soils

Soil and its productivity are critical elements to the forest because they also affect the productivity of most other forest resources. Tree growth, wildlife, and fish habitat are often associated with soil productivity (the soil component of long-term site productivity), which is the inherent capacity of a soil to support the growth of specific plants or plant communities. Soil depth and internal drainage have a major influence on soil productivity in the Port Houghton area. Well-drained soils normally have the highest productivity. High rainfall in the project area (i.e., approximately 160 inches per year), may decrease the soil productivity of poorly to very poorly drained soils due to saturated soil conditions.

In the project area, timber site productivity of mineral soils is anticipated to be from very high (on floodplains, glacial till plans, and lowland areas) to medium and high (on moderately well to well-drained soils) to lowest (in somewhat poorly to very poorly drained soils). Timber site productivity on poorly to very poorly drained organic soils, regardless of topographic elevation or exposure, is generally much lower than the productivity of mineral soils.

Timber harvest and road construction create soil disturbances that add to the soil erosion already occurring naturally. Maintaining organic-rich topsoil layers is, however, critical for long-term forest site productivity. Timber management activities also influence soil productivity and soil nutrient content. The topsoil layer can be impacted by natural forces such as mass wasting and surface erosion, and by man-made activities of severe yarding disturbance, road construction, and logging operations. These activities adversely impact soil productivity by changes

in surface runoff drainage patterns, increased soil saturation, soil compaction, soil permeability, and decreased aeration.

Cold temperatures may affect plant growth and—even under the best of conditions—tree growth on these soils appears to be very slow. However, regeneration seems to occur rather quickly on disturbed sites. Most of the conifers that grow in this area have shallow, or very shallow rooting systems, and are susceptible to blow down, especially if the timber stand is located in an exposed area. The shallow rooting habits of trees may be due to lack of adequate soil thickness, shallow depth of bedrock, or availability of moisture in the surface soil layer.

Site index is a measure of the relative productivity of a particular forest site. It is based on the relationship of the measured height and age of dominant trees in the stand. Height at 50 years of age is used on the Tongass National Forest. The soil with the highest soil productivity and site index in the project area is the Tuxekan series. The Tuxekan site index is 105 in the Stikine area. Based on the Chatham Land Systems Inventory, the same soil in the Chatham Area has a site index of 100. Apparently, when similar soil types occur on both the Stikine and Chatham areas, the soils type on the Stikine Area will usually have a slightly higher site index. This may indicate that the Stikine soils are slightly warmer (due to difference in latitude or sun angle) than the Chatham soils.

Soil Erosion - Surface erosion (sheet and rill erosion) is virtually nonexistent in unattended soil conditions under the forest canopy, except in areas of mass wasting, because the forest floor is completely covered, either by living vegetation, or by a thick mat of organic material. The tree canopy also shelters the soil surface from raindrop impact, so the forested soils have considerable protection. There is, likewise, no evidence of erosion in the muskeg areas. These organic soils have a very thick cover of forbs and shrubs, and the slopes are usually fairly gentle.

Mass Wasting - Mass failures, debris torrents, debris avalanches, etc. are all active in Southeast Alaska (Swanston 1971). They have occurred in undisturbed areas in the past and will continue in the future. Evidence of mass wasting was observed throughout the project area. The stability Class IV soil areas often have evidence of old scars, and may have a few recent scars from debris avalanches, or debris torrents. Class III stability areas also exhibit evidence of old scars; however, they seldom have indications of recent slope failures. Debris torrent and debris avalanche scars remain visible for many years, even after the area has revegetated.

Most of the failures within the project area originated in the mid- to upper-slope positions, usually in the upper end of small drainages. While the initial surge of energy from these failures is very great, it dissipates rather quickly once the debris hits an area with flatter slopes, or encounters timber or other obstacles.

The debris torrent usually takes a fairly narrow path, and the effects are often limited to the immediate vicinity of the path itself. Occasionally, the debris may block a stream channel and create short-term sediment problems; however, there is minimal evidence of this occurring in the project area. In many of the stream channels within the project area, several areas exist where suspended sediment could settle out or become trapped behind woody debris. Other factors that should be considered are the distance from the point where the failure originates and the location where suspended sediment may create a problem, such as the mouth of the main streams. Geologic erosion is a natural and continuing process that is very active within the project area. Evidence of this can be found in nearly every stream channel.

The risk for mass failures increases significantly whenever a large storm front comes to the area and drops significant rain within a short time period. Soils that occur on steep or very steep slopes, and are either wet or saturated prior to the storm event, have a very high risk for failure. Most failures in the project area can be traced to large storm events.

Soil stability in the Port Houghton/Cape Fanshaw project area was determined through aerial photograph review and field investigations. A soils hazard rating system was developed to identify the soils most sensitive to timber harvest and road construction, and to avoid these areas for road construction and timber harvest. The soils hazard classes are described below.

Stability Class I - Low Hazard Land. These areas have the least probability for landslides. Failures that may be associated with these areas are often adjacent to streams and are usually short, very steep localized escarpments. Most of these areas occur on slopes of less than 35 percent.

Stability Class II - Moderate Hazard Land. These areas are generally stable in an undisturbed condition and rarely show evidence of past failures or instability. The slopes generally range from 35 to about 70 percent. Soils in this class can be safely managed without a high risk of landslides, assuming that best management practices have been applied (practices designed to maintain the shear strength of soil and roots to avoid increasing the effective weight of the soil mass).

Stability Class III - High Hazard. These areas show evidence of past failure. Scars of old soil failures remain visible; however, there is minimal evidence of recent failures. Most of the historical failures originated on very steep slopes (greater than 70 percent), and many of the debris chutes extend well down into the more gently sloping valley bottoms. The risk of failures may increase when the soils are disturbed, such as by road construction or timber harvest. Road building and logging should employ soil management techniques that will not adversely impact soils.

Stability Class IV - Very High Hazard. These soils show evidence of frequent past failures, as well as recent failures. The failures occurred under natural conditions (unharvested and unroaded forestland). Most of the failures in the study area appear to be shallow types of events that originated on steep or very steep slopes greater than 70 percent. These failures often extend well below the slide zone into areas that have slopes of less than 30 percent. Some of these unstable areas may have tension cracks or other visible indications of instability such as jackstrawed trees or mixed pedogenic horizons. Other characteristics of very high hazard soils include soil texture that is typically fine-grained and uniform with a high moisture content. Soil depth is usually shallow with bedrock near the surface, and slope shape is concave or straight. Very high-hazard soils are located in several typical landform areas such as (1) steep uniform contour slopes, (2) directly below cliffs, (3) in the vicinity of deeply cut streams, (4) in shoreline areas undercut by wave action, and (5) in areas of poor drainage. These areas are very sensitive to management activities, and disturbance to these soils or alteration of the water balance should be avoided.

The project area is primarily comprised of Class I and II soils (64 percent) with hazard soils (Class III and IV) occurring near mountains in the terrestrial portions of the project area (Table 3-14). Class III soils (25,231 acres) occur on about twice as much land area as Class IV soils (13,757 acres), and comprise slightly less than 10 percent of the project area. Nonforested high-elevation lands and snow occur on less than 10 percent of the project area. Snow and high-elevation nonforested land occurs primarily near Lincoln Peak and at the extreme northeast section of the project area.

Table 3-14

Soil Hazard Classes Within the Port Houghton/Cape Fanshaw Project Area[1]

(Acres)

VCU	Class I and II	Class III	Class IV	Nonforested	Snow
79	23,456	10,258	5,460	5,606	1,258
80	7,070	1,111	939	1,252	0
81	14,383	238	424	0	0
82	30,870	2,523	1,251	6	0
83	11,272	1,815	698	287	0
84	10,070	4,058	3,042	2,362	1,070
85	18,633	914	242	0	0
86	10,780	119	10	0	0
87	12,820	1,444	1,128	35	0
88	5,061	679	201	0	0
89	18,716	1,871	274	0	0
Total	163,131	25,031	13,669	9,548	2,328

[1]Not including Goldbelt, Inc. lands.
Source: Morton 1995a

Steep slopes (greater than 70 percent) occur on 13 percent of the project area (Table 3-15). Steep slopes and hazard soils are generally within the same relative locations.

Table 3-15

Port Houghton/Cape Fanshaw Project Area Acreage by Slope[1]

VCU	Less Than 60% Slope	60-70% Slope	Greater Than 70% Slope
79	28,059	4,170	8,583
80	4,744	737	1,372
81	4,557	185	706
82	8,684	590	681
83	9,996	200	598
84	12,305	1,545	3,527
85	5,749	338	241
86	8,457	21	5
87	12,482	766	1,133
88	2,568	346	590
89	15,928	532	434
Total	113,528	3,360	17,939

[1]Not including Goldbelt, Inc. lands.

Source: Morton 1995a

For soil hazard discussion purposes, the project area can be divided into four geographic areas. The first area is the Stikine portion of the project area, referred to as South Fanshaw, which includes VCUs 85-89. The second area is that part of the Chatham Area that lies north of Port Houghton and adjacent to Goldbelt, Inc. lands, and referred to as North Shore, which includes VCU 79, part of 80, and 81. The third area is that portion of the Chatham Area that lies south of Port Houghton Sound and west of Sandborn Canal, called North Fanshaw, which includes VCU 82, 83, and part of 84. The last area is that part of the Chatham Area that lies south of Port Houghton Sound and east of Sandborn Canal, referred to as East Houghton, which includes parts of VCU 79 and 84.

The South Fanshaw area does not contain as many acres of stability Class III and Class IV soils as does the Chatham Area. This may be due to the increased acres of poorly and very poorly drained soils and fewer acres of very steep slopes. Stability Class IV soils comprise slightly less than four percent and stability Class III soils comprise 11 percent of South Fanshaw. There is a small area (less than one percent) of high-elevation non-forested land. Class III and IV soils occur near Jamestown Peak and the lower elevation mountains between Jamestown Peak and Farragut Bay including Tangent, Alaska, and Saranac peaks, as well as near Bay Point Knoll.

The North Fanshaw area has high-elevation non-forested land that occurs near Dahlgren Peak. Stability Class IV comprises about seven percent of this area, and stability Class III makes up about twenty percent of this area. Most of the stability Class III soils occur at elevations below fifteen hundred ft. Both stability classes III and IV areas occur in linear formations across North Fanshaw; however, the stability Class IV soils primarily occur in association with Dahlgren Peak.

The North Shore Area has high-hazard soils primarily north of North Arm where all of the soils are either hazard or nonforested. Other areas of high hazard soils occur north and east of Goldbelt, Inc. lands. Approximately five percent of the area is comprised of high-elevation non-forested land. Stability Class III soils comprise another thirty-five percent of the area, and Class IV soils comprise approximately thirty percent of the area. The largest percentage of sensitive lands occur in the eastern portion of this area.

The East Houghton area is the most complex of the entire project area, because there is such a wide range in elevations, and the mountains are a dominant feature that affects both the soil and vegetation patterns. Approximately three percent of the area is snow covered most of the year, and another ten percent of the area is high-elevation and nonforested. Stability Class IV comprises about seventeen percent of this area, and stability Class III comprises about thirty percent of this area. Class III and IV soils are associated with Washington and Lincoln peaks along the east side of Sandborn Canal. Another high-hazard area is south of the junction between North Arm and Salt Chuck. Areas of snow and high-elevation nonforested lands are associated with Lincoln Peak.

Wetlands

Wetlands within the Port Houghton/Cape Fanshaw project area were delineated using the Forest Service GIS database for soils and plant community types, and the 1987 *Wetland Delineation Manual* (Environmental Laboratory 1987). Wetlands are classified according to major vegetation types (Cowardin et al. 1979). The functional value of wetlands is evaluated using criteria identified by Reppert et al. (1979) and Adamus et al. (1987).

Large areas of the Port Houghton/Cape Fanshaw project area are wetlands or complexes of upland and wetland environments. Wetlands cover approximately 44,280 acres of the project area. Wetland types present (with their respective Cowardin 1979 classification) include coniferous forested wetlands (palustrine forested), mixed forest/muskeg wetlands (palustrine forested/palustrine emergent), muskeg wetlands (palustrine emergent and palustrine scrub-shrub), estuarine wetlands (estuarine intertidal unconsolidated shore and estuarine intertidal emergent), alpine/subalpine wetlands (palustrine emergent and palustrine shrub-scrub), and open water (palustrine open water or lacustrine open water).

Alpine and subalpine wetlands occur above 1,500 ft. These wetlands include a variety of upland/wetland mixed types, sedge meadows, muskegs, riparian areas,

and poorly drained alpine meadows. They are typically dominated by dwarf shrubs, grasses, sedges, and various forbs. At lower elevations, dwarfed trees are also present. These wetlands typically provide limited wildlife habitat functions and varied hydrologic functions.

Below the 1,500-ft elevation, the dominant wetland types in the project area are muskeg and forested/muskeg mixed wetlands (9,720 and 10,020 acres, respectively). These wetlands cover extensive areas throughout the project area, typically occurring on level to gently sloping terrain where underlying soils have low permeabilities. Muskegs provide habitat to wildlife species not dependent on old-growth forests, travel corridors for large mammals, and important hydrologic functions.

Coniferous forested wetlands cover approximately 6,320 acres of the project area. These wetlands are often found on gentle to moderate slopes on poorly drained soils or areas of groundwater discharge. Approximately 12,960 acres of forest occur on poorly drained soils that are not classified as wetlands because they are not dominated by wetland plants (DeMeo and Loggy 1989). Forested wetlands provide significant wildlife habitat functions and frequently function as areas of groundwater discharge.

Estuarine wetlands (1,420 acres) are located near the mouths of larger streams. These wetlands include mudflats exposed at low tides, areas of emergent salt-tolerant vegetation, and adjacent meadows (dominated by salt-intolerant plants) slightly above the elevation of high tides (Stone 1993). Estuarine wetlands provide significant wildlife habitat functions and export food resources to adjacent marine systems. Estuarine wetlands provide significant sedimentation functions.

Open water in the project area includes 34 lakes and ponds. These areas include small shallow ponds associated with palustrine wetlands, as well as larger lakes (up to 100 acres). Shoreline areas are classified as lacustrine or palustrine wetlands that are dominated by emergent, submerged, or floating aquatic plants. Lakes provide important sediment retention functions, hydrologic detention, aquatic habitat, and food export functions.

Floodplains

Two parameters, stream order and stream gradient, were used to calculate approximate 100-year floodplain widths. The stream order parameter (Hynes 1970) integrates watershed area and discharge characteristics for watersheds having similar climate and geological characteristics. The stream gradient parameter is correlated to the water velocities and discharge capacity of stream channels. The floodplain model used for the project area considers floodplain widths as a function of stream order (watershed area) and stream gradient (discharge capacity) as described below:

Class A Floodplains (less than 25 ft wide) - include all stream segments of first-order streams and second-order streams with gradients of 10 percent or more.

Class B Floodplains (25 ft up to 100 ft wide) - include all second-order stream segments with a gradient of less than 10 percent.

Class C Floodplains (greater than 100 ft) - include all third-order and higher streams.

Floodplains of all stream segments were determined using the Forest Service GIS database for the project area (streams and topography layers). GIS analysis was used to determine and map the floodplain class of each stream segment.

Floodplains occur on 415 miles of streams within the project area. Most stream segments (295 miles or 71 percent) were classified as having Class A floodplains. Class B floodplains (between 25 and 100 ft) were mapped along portions of over 60 streams (52 miles or 13 percent of the total stream length). Class B floodplains occur on second-order streams with relatively gentle terrain. Most are near the headwaters of watersheds, at 500 ft elevation or above.

The floodplains of larger rivers and streams are classified as Class C floodplains (greater than 100 ft in width). In the Port Houghton/Cape Fanshaw project area, Class C floodplains occur on third-, and fourth-order streams at elevations below 500 ft. Because these larger streams typically remain moderately incised, they have floodplains less than 200 ft in width.

Subsistence (Issue 8)

Subsistence resources are an integral part of rural Southeast Alaskan lifestyle. Section 810, Title VIII, of the Alaska National Interest Lands Conservation Act (ANILCA) states that the director of a federal agency which has primary jurisdiction over public lands must evaluate the effects that economic and consumptive use of those lands has on subsistence needs. Only Alaskans living in communities designated rural by the Federal Subsistence Board are allowed to harvest subsistence resources. ANILCA defines subsistence as:

> . . . the customary and traditional uses by rural Alaskan residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade (ANILCA, 16 USC 3113 p. 390).

Gathering and sharing subsistence resources is a focal point of rural life in Southeast Alaska. One in three households obtains at least half the food it consumes from its own harvest activities (Kruse and Muth 1990). Gathering and consumption of subsistence resources is important regardless of household income: subsistence harvest activity does not decrease in response to an increase in household income (Kruse and Muth 1990).

Sharing is an important component of subsistence, involving distribution of resources throughout families, the community, and in some instances, between communities (Kruse and Muth 1990). Through subsistence harvest, consumption, sharing, and exchange, residents of rural Alaska can express traditional and cultural beliefs by demonstrating the willingness to participate in the gathering of renewable subsistence resources.

Communities Using the Project Area for Subsistence

Petersburg/City of Kupreanof

Petersburg is located on Mitkof Island, approximately 30 miles southwest of the project area. The town developed around a single cannery started in 1900 by a Norwegian immigrant named Peter Buschmann. Commercial fishing is still economically important to Petersburg. Large-scale logging was introduced to the area in the 1960s and timber became economically important to the community. Since the 1970s, the government has become the second largest employment sector. Construction, retail sales, and tourism are also important to the local economy.

The second class City of Kupreanof is located directly across Wrangell Narrows from Petersburg. It has less than 50 people and travel to and from the city is by boat. Public services are limited.

Tlingit tribes occupied the Petersburg area before European contact. The Kake Tlingit established a summer fishing camp on the north end of Mitkof Island. As Europeans settled Petersburg and the community flourished, the Tlingit community became a stable component of the town. In 1988, fourteen percent of the population of Petersburg was Alaskan Native. The population of Petersburg is 3,230 residents.

Petersburg/Kupreanof residents actively harvest and consume subsistence resources. The annual harvest of subsistence resources for all areas is 200 pounds per capita, or 31 percent of the household meat supply (Table 3-16). Ninety-four percent of Petersburg households harvest wild resources. The resources most harvested are salmon, deer, and finfish other than salmon (Table 3-17). Other resources used include marine invertebrates and edible plants and berries (ADF&G Division of Subsistence 1992a).

Table 3-16
Community Subsistence Harvest and Use Information

Community[1]	Population[2]	U.S. Census Median 1990 Household Income[2]	1987 Average lbs per Capita Harvest[2]	Percent Household Meat Supply[3]
Kake	700	35,875	158.59	22
Petersburg/ Kupreanof	3,230	49,318	200.29	31
Wrangell	2,479	37,538	164.27	23

[1]Information for Hobart Bay is not available.
[2]ADF&G Division of Subsistence (1992).
[3]Kruse and Muth 1990.
Source: Boyle 1995

Table 3-17
Pounds Per Capita Harvest of Subsistence Resources in 1987

Community[1]	Salmon	Deer	Other Game[2]	Finfish	Harbor Seal	Marine Invertebrates
Petersburg/ Kupreanof	38.9	43.9	18.9	40.41	0	23.6
Wrangell	23.4	20.4	16.9	38.6	7.0	32.7
Kake	24.3	38.6	0	25.6	24.5	14.6

[1] Hobart Bay information is not available.
[2] Other game includes black bear, moose, and mountain goat.
Source: ADF&G Division of Subsistence (1992).

Petersburg residents obtain most of their resources from the Tongass National Forest outside of the project area. Petersburg residents that do hunt in the Port Houghton/Cape Fanshaw project area use North Fanshaw, areas around the Port Houghton Salt Chuck, and land near Cape Fanshaw and Farragut Bay (figures supporting subsistence are in Appendix F). Most of the Petersburg harvest occurs near Fanshaw Bay (Appendix F). Only the Stikine portion of the project area was used for deer harvest between 1987 and 1992 (Table 3-18).

Petersburg residents use Farragut Bay North Arm and Fanshaw Bay for salmon and other finfish harvest within the project area (Appendix F). Shellfish harvest is limited to shallow waters in Sandborn Canal, Farragut Bay North Arm, and Fanshaw Bay. Petersburg is the only community that reports harvesting waterfowl in the project area, using Farragut Bay, Sandborn Canal and the flats between Port Houghton North Arm and the Salt Chuck. Petersburg residents trap furbearing animals (river otter, mink, and marten) along the north and south shores of Port Houghton and the western edge of Farragut Bay North Arm. Petersburg residents harvest more marten from the project area than any other community (Table 3-19). Petersburg residents hunt moose in the North Fanshaw area and lands

Table 3-18

Number of Deer Harvested in the Port Houghton/Cape Fanshaw Project Area

Community	Southeast Alaska	(1987-1992 Harvest) WAA 1601[1]	WAA 2927[2]
Kake	1,349	0	0
Hobart Bay	127	0	14
Petersburg/Kupreanof	6,813	5	0
Wrangell	2,080	0	0

[1]WAA 1601 consists of VCUs 85, 86, 87, 88, and 89.

[2]WAA 2929 consists of VCUs 78, 79, 80, 81, 82, 83, and 84.

Source: Data was prepared from 1987-1992 deer harvest summary tables, ADF&G Division of Subsistence.

adjacent to the Port Houghton North Arm (Paul 1994). Mountain goat hunting by Petersburg residents occurs in the southeast portion of the project area near Farragut Bay (Appendix F), and north of the Port Houghton Salt Chuck. Petersburg residents hunt bear in Sandborn Canal and Fanshaw Bay.

Table 3-19

Number of Marten Harvested in the Port Houghton/Cape Fanshaw Project Area

Year	Community	Males	Females	VCU
1988	none reported			
1989	Petersburg	2	8	80
1989	Petersburg	6	0	84
1989	Wrangell	4	1	82
1990	Wrangell	5	0	82
1991	Juneau[1]	1	0	83
1991	Hobart Bay	2	3	81
1991	Petersburg	6	2	82
1992	Petersburg	3	2	82
1993	none reported			

[1]Juneau is not a rural community. Juneau information is included to show total marten harvest.

Source: Paul 1995

Petersburg residents share resources throughout the community. Historical data show that 86 percent of Petersburg households that harvest subsistence resources share these resources with other households, and 92 percent of households receive subsistence resources from other households. This distributes resources to

households that may not directly harvest resources themselves. For example, although only 39 percent of Petersburg households harvest deer, nearly 70 percent consume this resource (ADF&G Division of Subsistence 1992b).

Wrangell

The community of Wrangell is located on the northern tip of Wrangell Island, 63 miles southeast of the project area. Situated near the mouth of the Stikine River, Wrangell was historically considered an important site for access to the mainland interior by the Stikine tribe of the Tlingit. In the late 1700s, British, Russian and American ships began arriving in the area. Early attempts at occupation and settlement were resisted by the powerful Stikine Tlingit. In 1836 the Russian-American company established a trading post on the Stikine River, with the Stikine Tlingit profiting as middlemen between the traders and interior fur gatherers. In the early 1860s, reports of gold in the region attracted prospectors and the post became a local center of commerce and transportation. Later, the American Army built Fort Wrangell on the Stikine River (Cohen 1989).

Residents began expanding the Wrangell economic base by establishing canneries and sawmills in the late 19th century. A sawmill, fish cannery, cabinet shops, and breweries were established by the early 20th century. Retail services now account for the largest sector in the Wrangell economy (25.8 percent in 1987), followed by timber (15.9 percent), fishing (13.6 percent), utilities (13.7 percent), construction (9.9 percent), and trade (8 percent) (Betts et al. 1992).

The 1990 population estimate for Wrangell was 2,479 residents. In 1988 the population consisted of 55 percent Caucasian, 38 percent Native Alaskan, and 7 percent other people (ADF&G Division of Subsistence 1992b).

Subsistence resources are important to the community of Wrangell; 80 percent of households harvested subsistence resources in 1987 (ADF&G Division of Subsistence 1992b). The per capita harvest of all resources (for all areas) was 164 pounds (see Table 3-16), including marine invertebrates, salmon, other finfish, deer, seal, and plants and berries (see Table 3-17). Half of the deer harvested by Wrangell residents is obtained in areas near Wrangell Island, with the rest of the harvest spread over many areas. Deer harvest information indicates that no deer are harvested by Wrangell residents in the project area (see Table 3-18). Subsistence salmon fishing is generally limited to waters close to Wrangell; fewer than ten percent of Wrangell households fish waters more than 20-25 miles from Wrangell (ADF&G Division of Subsistence 1992b). Fanshaw Bay and Farragut Bay are locations within the project area where salmon (Appendix F) and other finfish are harvested. The south end of Whitney Island is used for marine invertebrate collection and Fanshaw Bay is used for hunting seals. ADF&G marten harvest information indicates that Wrangell residents trap furbearers along the northwest shore of Cape Fanshaw.

In Wrangell, sharing of subsistence resources provides a distribution network among households which have varying degrees of involvement in harvesting these resources. In 1987, only 28 percent of households harvested deer while 63 percent used the resource. Ninety-five percent of Wrangell households use subsistence resources (ADF&G Division of Subsistence 1992b).

Kake

Kake is located about 21 miles from the project area, on the northwest coast of Kupreanof Island. The population of 700 people (1990), is comprised of 70 percent Native, 28 percent Caucasian, and 2 percent other peoples (ADF&G Division of Subsistence 1992b).

The current location of Kake was occupied from the early 1700s, throughout the 1800s as a winter village for the people of surrounding settlements. After the United States purchased Alaska in 1867, the Kake Tlingit continued to live in their territory assuming that they were only allowing the settlers to use it (Firman and Bosworth 1990). This assumption led to confrontations with the military administration which culminated in the 1869 bombardment of three Kake villages by American ships. During the 1890s, Quakers founded a school in Kake, which was followed by a government school in 1905. Kake children were required to attend, resulting in the abandonment of surrounding villages (Firman and Bosworth 1990). In the late 1800s and early 1900s canneries were established in Kake. Local timber harvest provided fish barrels and timber for related construction projects (Betts et al. 1992). In 1952, Kake was incorporated as a first class city. The passage of the Alaska Native Claims Settlement Act (ANILCA) in 1971 resulted in the selection of incorporated Native lands (Firman and Bosworth 1990).

The Soderberg Logging Company constructed a logging camp in 1968 to harvest on National Forest Land, and in the 1980s the Kake Tribal Corporation began logging on tribal land. In the late 1980s and early 1990s, the community of Kake developed initiatives to expand the local commercial fishing industry and retain long-term employment income. In 1987, commercial fishing and retail services comprised the largest industries of the local economy. Transportation, logging and utilities were also important (Firman and Bosworth 1990).

The TRUCS data identify a high percentage of Kake households (91 percent) that harvest subsistence resources. In 1987, the per capita harvest was 159 lbs (see Table 3-16) including salmon, deer, other finfish, marine invertebrates, seals, and plants and berries (see Table 3-17). Marine resources comprise 85 percent of the per capita harvest in Kake (Betts et al. 1992). Kake residents use subsistence fishing gear as well as other fishing gear (Table 3-20). Kake residents identify

Table 3-20

Reported Salmon Catch by Kake, Petersburg, and Wrangell Residents

Community	Total Harvest (fish)	Number Caught with Subsistence Gear[1]
Kake	3,921	2,785
Petersburg/ Kupreanof	19,372	16,070
Wrangell	8,099	6,207

[1]Subsistence gear includes nets and lines, and rod and reel.

Note: Information for Hobart Bay is not available.

Source: ADF&G Community Profile Database, Harvest Year 1987.

North Fanshaw as an area of deer harvest (Appendix F), although ADF&G deer harvest information does not indicate any reported deer harvest from the project area by Kake residents between 1987 and 1992.

The sharing and exchange of subsistence resources among relatives and friends in Kake occurs within 97 percent of households. In 1987, 66 percent of households surveyed reported sharing resources, and 91 percent reported receiving resources (ADF&G Division of Subsistence 1992b).

Hobart Bay

The community of Hobart Bay is located on the south shore of Hobart Bay 5 miles north of the project area. The population of Hobart Bay fluctuates from a winter population of approximately 12 to 100 people in the summer (Dwyer 1994). Ethnicity statistics are not available for Hobart Bay. The unincorporated community of Hobart Bay was established in 1981 as a logging community operated by Goldbelt, Inc. a Juneau-based Native corporation, which contracts Rayonier International Forest Products for harvesting and shipping operations. The community is expected to operate until at least 1997. Timber harvest, road building, and supporting services are the only employment sources in Hobart Bay (Dwyer 1994).

Hobart Bay is not included in the TRUCS database, and hunting and trapping are not allowed on Goldbelt lands. Hobart Bay residents harvest subsistence resources in the northern portion of Port Houghton, which is easily accessed by existing logging roads. During public scoping meetings for the Port Houghton/Cape Fanshaw EIS, residents of Hobart Bay reported harvesting deer from lands around Sandborn Canal and north of Port Houghton (Appendix F). The waters of the Port Houghton Salt Chuck, Sandborn Canal, and northwest Port Houghton are identified as salmon and other finfish harvest areas. Hobart Bay residents trap marten (a furbearer) along the northwest shore of Port Houghton. Hobart Bay residents also report harvesting mountain goat and bear.

Resources Harvested in the Project Area

Salmon

Salmon constitute 21 percent of all subsistence resources harvested in Southeast Alaska (Kruse and Muth 1990). Within the Port Houghton/Cape Fanshaw project area, salmon are harvested by residents of Wrangell, Petersburg, and Hobart Bay (Appendix F). Fanshaw and Farragut Bays are preferred by Petersburg and Wrangell residents, whereas Hobart Bay residents use Sandborn Canal, the Port Houghton Salt Chuck, and the northwest portion of Port Houghton (Port Houghton/Cape Fanshaw EIS scoping meeting on September 25, 1994).

Deer

Coastal and adjacent lowland elevations near Farragut Bay, Fanshaw Bay, North Fanshaw, Sandborn Canal and the Port Houghton Salt Chuck are identified as locations within the project area where deer hunting occurs (Appendix F). A review of ADF&G Southeast Alaska Deer Harvest summary tables indicates that Hobart Bay and Petersburg are the primary deer hunting communities, and that Kake and Wrangell residents do not report any recent hunting in the area. Hobart Bay residents harvested all the deer reported in WAA 2927 from 1987 to 1992, and Petersburg hunters obtained 100 percent of all deer reported for WAA 1601 during the same period (see Table 3-18). From 1987 to 1992, the project area accounted for 12 percent of deer harvested by Hobart Bay and less than one percent of the deer harvested by Petersburg residents (ADF&G Division of Subsistence 1992b).

Different data collection methods may account for the discrepancies in deer harvest information. TRUCS data are based on surveys designed to indicate where resources are harvested rather than the level of harvest. The ADF&G data are survey responses that do not differentiate between subsistence and non-subsistence harvest. The ADF&G information may more accurately reflect current use.

Finfish and Shellfish

Finfish (including halibut, herring, cod, rockfish, eulachon, and trout) account for 24 percent of the total subsistence harvest in Southeast Alaska. The most commonly harvested finfish other than salmon is halibut, which is harvested by 48 percent of all households (Kruse and Muth 1990). Fanshaw and Farragut Bays are used by Petersburg and Wrangell residents, while Hobart Bay residents harvest finfish in Port Houghton (Appendix F).

Shellfish (including clams, crab, and shrimp) account for 16 percent of the total subsistence harvest in Southeast Alaska (Kruse and Muth 1990). Residents of Wrangell and Petersburg harvest shellfish in Farragut Bay, Fanshaw Bay, and Sandborn Canal (Appendix F).

Waterfowl

Fewer than one percent of the subsistence resources consumed in Southeast Alaska are waterfowl (Kruse and Muth 1990). Petersburg residents indicate that they hunt waterfowl in the project area (Appendix F) using the flats in the Port Houghton Salt Chuck Sandborn Canal and Farragut Bay (Smythe 1988; Doerr 1995).

Harbor Seals

The harbor seal accounts for 3 percent of all subsistence resources harvested in Southeast Alaska (Kruse and Muth 1990). Wrangell is the only community that identifies seal harvest areas within the project area (Appendix F), though areas closer to Wrangell are preferred (ADF&G Division of Subsistence 1992b). Only Native Americans are allowed to harvest seals. Harbor seals are harvested from Fanshaw Bay.

Furbearers

The coastal areas of the Fanshaw Peninsula and Farragut Bay are locations where furbearers (river otter, mink, and marten) are trapped (Appendix F). Furbearers are trapped for pelts rather than consumption, and households do not exchange pelts (ADF&G Division of Subsistence 1992b).

Cultural Resources (Issue 9)

Cultural resources represent evidence of past human activity, dating from the earliest maritime hunters and gatherers to occupy Southeast Alaska, to fishing, mining, fox farming, and lumbering activities in the 20th century. Non-renewable cultural resources include the physical remains of districts, sites, structures, buildings, and objects used by humans that have significance in prehistory or history. Other non-physical resources identified through ethnohistorical or oral history research may have traditional or spiritual significance for contemporary Native Americans. Cultural resources located in the Tongass National Forest encompass a wide variety of prehistoric and historic sites and artifacts that reflect nearly 10,000 years of human occupation and resource use. Information obtained through the study and analysis of these sites and objects, many of which constitute the only record of former cultural traditions, can be of importance in the reconstruction of past human responses and adaptations to environmental and social change.

For a site to be considered "historic," it must be more than 50 years old, unless it has exceptional national, state, or local significance. From a strictly legal standpoint, properties are historically significant if they qualify for inclusion in the National Register of Historic Places.

Prehistory

The prehistory of Southeast Alaska is poorly understood, especially along the mainland coast where prior cultural resource investigations have been extremely limited. The principal summary of cultural resource information for the Tongass National Forest (Arndt et al. 1987), is augmented for the Port Houghton/Cape Fanshaw EIS Project area by two Forest Service reports on cultural resource investigations at Port Houghton. Forest Service archaeologists surveyed portions of the project area in 1981 for the proposed NATS A-Frame Timber Sale (Stanford and Lightfoot 1981) and conducted testing of a late prehistoric site at the entrance to Port Houghton in 1983 (Davis 1985). These USDA-FS investigations, USDA-FS files, a comprehensive literature review, oral history interviews, and the present cultural resource inventory, conducted in 1994, form the basis for the knowledge of cultural resources in the Port Houghton/Cape Fanshaw EIS Project area.

Human use of the landscape through time has been influenced by elevation, slope, natural resource availability and other environmental factors. Certain kinds of cultural resources (such as sites, artifacts, and other detectable archaeological remains) have a greater probability of being located in specific areas where resource exploitation has been concentrated, or where natural erosion has been more likely to expose evidence of past human activity. These areas include intertidal zones, beach fringes, anadromous streams, riparian zones, areas of known mineral deposits or other natural resources. Because of past sea level fluctuation and resulting coastline changes, evidence of early human activity associated with paleocoastlines may be located further inland and at higher elevations than more recent cultural remains. Prior inventory efforts on the Tongass National Forest have shown that, with few exceptions, prehistoric and historic sites are usually found below 100 ft elevation associated with present or past coastlines. While the potential for the occurrence of cultural resources at elevations greater than 100 ft is generally low, some types of sites, especially those associated with hunting and trapping or historic mining activity, may occur at any elevation.

The prehistory of Southeast Alaska may be divided into several cultural/temporal units, based mainly on technologies and inferred subsistence strategies. The earliest, the Paleomarine Tradition, endured for several millenia from the early to mid-Holocene when, about 6,500 years ago, microblade technology began to be replaced by artifact assemblages with ground stone tools, polished slate, and an apparent emphasis on bone tools (Davis 1990; Moss 1993). The Transitional Stage of Southeast Alaska prehistory, which appears to have begun between 6,500 and 5,000 years ago, marks the change between microlith technology and the ground stone industries associated with the succeeding Developmental Northwest Coast Stage. This third major cultural pattern evident in Southeast Alaska is associated with the Tlingit and Haida people who occupied the region at the time of historic contact. Large shell middens, house features and burials, as well as a wide range of artifacts (including barbed harpoon heads, labrets, and ground stone

tools), are characteristic of this most recent Northwest Coast cultural stage. Davis (1990) has subdivided the developmental Northwest Coast Stage into three phases: the early Phase dating from 5,000-3,000 B.P., the Middle Phase from 3,000-1,000 B.P., and the Late Phase dating from 1,000 B.P. to European contact.

Dates on the earliest cultural remains at the Ground Hog Bay 2 site on Icy Strait near Glacier Bay (Ackerman 1968) and at the Hidden Falls site on Baranof Island (Davis 1989) indicate occupation of Southeast Alaska by a maritime hunting people extends back at least 9,500 years. Prior to the present survey, the only dated prehistoric site in the vicinity of the project area was the late prehistoric site at the entrance to Port Houghton, with a single uncorrected radiometric date of 360 +/- 60 B.P. (AD 1590) reported by Davis (1985:34).

Ethnohistory

Southeast Alaska is presently inhabited by three linguistically distinct Native groups: the Tlingit, Haida, and Tsimshian (de Laguna 1990). Historically, the Tlingit have been the dominant group controlling most of Southeast Alaska. Niblack (1970, Chart I) maps the mainland coast from Thomas Bay northward to the vicinity of Windham Bay as constituting part of the territory traditionally used by the Kake Tlingit, although the southern mainland territorial boundary between the Kake Tlingit and the Wrangell Stikine Tlingit appears, on the basis of information collected by Goldschmidt and Haas (1946), to have been at Fanshaw Bay. Goldschmidt and Haas (1946:160) report that no Stikine Tlingit claimed any territory north of Cape Fanshaw, but that Wrangell people hunted as far as Farragut Bay and, on occasion, went as far northward as Cape Fanshaw. Apparently Kake Tlingit traditionally claimed the mainland coast from Cape Fanshaw north to Windham Bay, beyond which the territory belonged to the Taku Tlingit (Goldschmidt and Haas 1946:160).

History

In the late 1700s, Russian, Spanish, French, English, and American ships began exploration and trading voyages along the coast of Southeast Alaska; this brought the Tlingit into direct contact with Europeans and Americans. The earliest historical information pertaining to the Port Houghton/Cape Fanshaw project area resulted from Vancouver's explorations in search of a Northwest Passage in 1794. Port Houghton, named by Capt. Vancouver for a town in Norfolk, England (Orth 1967:433), was sighted on August 14, 1794 by one of Vancouver's boat crews under the command of Lt. Joseph Whidbey as he progressed southward along the mainland coast of the Alexander Archipelago during the final days of Vancouver's third and last season on the Northwest Coast. Lamb (Vancouver 1984:1378) comments that "the name [Port Houghton] was obviously suggested by Houghton Hall, the mansion built for Sir Robert Walpole near Harpley, Norfolk, a dozen miles from King's Lynn...." Cape Fanshaw, at the south end of Stephens Passage, between Fanshaw Bay and Frederick Sound, also first described by Lt. Whidbey, was subsequently named by Vancouver (Orth 1967:433). No Natives were encountered by Lt. Whidbey in the immediate vicinity of Port Houghton or Cape Fanshaw, but Whidbey reported a deserted village "at Cape Fanshaw" for which he gives no details.

Following Vancouver's mapping of Southeast Alaska, Tlingit contact with Euroamericans in the region was marked by increasing hostility (de Laguna 1990; Dean 1994). To exploit the large sea otter populations in Southeast Alaska, Alexander Baranof moved the headquarters of the Russian American Company from Kodiak Island to Baranof Island in 1799. There he established the first permanent Russian settlement in Southeast Alaska, *Novo Arkhangelsk,* six miles north of present day Sitka. This Russian redoubt was attacked and destroyed by the Tlingit in 1802, and Sitka was subsequently retaken by the Russians in 1804. In 1803 the Kake kwaan and Kuiu kwaan Tlingit attacked a Russian American Company party in Keku Straits. The following year, in retaliation for this attack, Baranof sent four ships and 400 kayaks from his post at Kodiak to Kuiu and Kupreanof islands where they destroyed Tlingit villages and food supplies (Rabich Campbell 1987; Arndt et al. 1987). The Russians were never able to move freely in Southeast Alaska without fear of attack from the Tlingit. Russia's presence in Southeast Alaska following 1804 was for the most part restricted to the immediate vicinity of Sitka.

Following the purchase of Alaska from Russia by the United States in 1867, Southeast Alaska fell under the control of Major General Jefferson C. Davis, the American military governor of the Alaska District. In 1868, the U.S. Army and Treasury Department cooperated in staging a number of punitive expeditions against Tlingit villages for various offenses. American military strength was able to establish its government's sovereignty and halt continued hostilities between rival Tlingit kwaans and between the Tlingits and Americans, but strong enmity continued to exist between the various Tlingit kwaans (Dean 1994).

One of the earliest American visitors to the Port Houghton/Cape Fanshaw area was the naturalist John Muir, who traveled the mainland coastline in 1879 and 1880. Returning from Glacier Bay, Muir camped on Whitney Island near the entrance to Port Houghton. The following year, departing from Fort Wrangell in August, Muir traveled north in a cedar canoe (Muir 1993). By August 18th, Muir had reached the Vicinity of Cape Fanshaw where his party encountered another canoe containing a party of Tlingit Indians from "Hoona." Farragut Bay, Whitney Island, Fanshaw Bay, and Cleveland Passage were named in 1887 when U.S. Navy Lt. Comdr. C.M. Thomas visited the Port Houghton/Cape Fanshaw area.

The fishing industry became the earliest American commercial enterprise in Southeast Alaska. The village of Cape Fanshaw was established in 1901 on the mainland just south of Port Houghton near the southern tip of Whitney Island. Named for Cape Fanshaw, three miles to the southwest, the town was a fishing village and the site of several saltery and cannery operations in the early 1900s (Orth 1967). Ricks (1965) reports a post office was briefly established at Cape Fanshaw in 1902, but mail service was discontinued in July of 1903 and not reestablished until 1921. A post office continued to serve the village of Cape Fanshaw from 1921 until 1953 when mail service was terminated.

The earliest fishing industry site in the Port Houghton/Cape Fanshaw project area is apparently associated with the A.H. Sonsthagen Saltery, which operated at Cape Fanshaw in 1907 and 1908 (Arndt 1980). In 1909 the Engelbert Wiese Saltery moved its operations to Cape Fanshaw from the Stikine River. Wiese was still running a mild-curing operation at Cape Fanshaw in 1915 (Arndt 1980). In the spring of 1916 the Engelbert Wiese Company went out of business and their Cape Fanshaw mild-cure operations were taken over by the Pacific Mild-Cure Company (Arndt 1980:53). In 1913 the Pacific Coast and Norway Packing Company briefly operated a mild-cure station at Cape Fanshaw. The station was apparently discontinued in 1914 (Arndt 1980). The Southern Alaska Canning Company briefly operated a mild-curing station at Cape Fanshaw in 1918.

Three canning operations were active at Cape Fanshaw between 1919 and 1920. The Cape Fanshaw Fish and Packing Company, Inc. operated in 1919 but was idle from 1920 through 1922 and went permanently out of business in 1923 (Arndt 1980:21). A Seattle-based packing company, the Alaska Sanitary Packing Company, built a plant at Cape Fanshaw in 1919 and operated at that location for two years. That plant then stood idle from 1921 through 1938 when it was abandoned (Arndt 1980). The Marathon Fishing and Packing Company moved its operations to Cape Fanshaw in 1919 where it operated a stationary plant through 1920. After 1920 there is no record of continued fishing industry operations at Cape Fanshaw until the 1940s, when Feist and Olson began operating a crab and clam cannery at the village of Fanshaw (Arndt 1980). The Feist and Olson cannery was converted to a salmon cannery by Fanshaw Fisheries in 1946.

Mining came into prominence in Southeast Alaska in the last decades of the 1800s. Gold was first discovered in Southeast Alaska in 1869-1870 at Sumdum and Windham Bay, located about 20 mi north of Port Houghton (Redman 1986; Redman et al. 1985; Stone and Stone 1980). The 1897 gold strike in the Yukon Territory brought thousands of people (headed for the Klondike gold fields) into Alaska. Wrangell became an important shipment point for the Klondike, and prospecting and hard rock mining activity increased in Southeast Alaska. In the early twentieth century, mining was second only to the fishing industry in economic importance to Southeast Alaska (Arndt et al. 1987). In addition to gold, interest in minerals such as copper, lead, silver, and zinc was strong. However, rising production costs, a fixed gold price, and wartime manpower shortages in the 1940s lead to a significant decrease in mining activity (Arndt et al. 1987).

Despite the relatively high level of late nineteenth century and early twentieth century mining activity in the adjacent Windham Bay area, prospecting and hard rock mining on the mainland within the Port Houghton/Cape Fanshaw Project area has been fairly minimal. Arndt et al. (1987) indicate three locations of past mining activity in the vicinity of Port Houghton. These include claims associated with the Port Houghton prospect (copper), Louise #1-6 (copper and silver), and The Islander (gold, silver, zinc). The earliest mining activity in the project area

appears to have been an adit and drift mining operation called the Port Houghton Prospect, a copper deposit developed prior to 1923.

Commercial logging on the Tongass National Forest dates back to 1833 when the first Alaska sawmill was built at Redoubt Bay near Sitka (Territorial Sportsman, Inc. 1985). By 1887, there were five sawmills in Southeast Alaska and by 1889 eleven small sawmills were operating (Arndt et al. 1987). Early selective logging concentrated on large, high-quality, individual trees close to tidewater. These early hand-logging efforts were generally restricted to the cutting of small "pumpkin patches" along a narrow coastal strip from where the logs could be easily skidded into the water. Timber was cut under contract to a mill, mining company, or cannery, and the logs were rafted and towed to sawmills. Local timber production gradually increased during the early 1900s with the proliferation of canneries and towns throughout Southeast Alaska. By 1923, six sawmills were cutting lumber in large quantities for local use and export. Most superior stands of timber easily reached from protected shores had been logged by 1930 and increasing emphasis was being placed on developing a pulpwood industry to use the smaller timber (Territorial Sportsman, Inc. 1985).

Fur farming, which began as early as the mid-1880s in Western Alaska, became a major economic endeavor in Southeast Alaska early in the 20th century (Arndt et al. 1987). Fox and mink farms were normally located on the mainland coast or on offshore islands where a breeding population, once established, could be harvested for furs. Animals were allowed to run free and were trapped periodically in live traps that preserved the fur. By 1899 a blue fox farm had been established on Sumdum Island in Southeast Alaska and by 1905 several islands in Frederick Sound had been stocked with blue foxes; however, the early years of fur farming in this region are poorly documented (Arndt et al. 1987). After 1913 a renewed interest in fox farming resulted in an increase in the practice of stocking small islands with free-roaming animals and in efforts to breed locally caught mink and marten. Arndt et al. (1987) report that "by the early 1920s many of these experiments had proven impractical and increasing numbers of islands throughout the region were leased from the Forest Service to be stocked with blue fox."

Testimony of Kake residents in 1944 (Goldschmidt and Haas 1946) and Forest Service special use permits document the use of Whitney Island, Storm Island, Roberts Island and Walter Island as fox farms in the years prior to World War II. The wartime economy, changes in fashion, and stricter fishing regulations making fox feed more difficult to obtain resulted in the abandonment of many fur farms and by 1945 only 75 fur farms remained operating in the entire Alaskan Territory (Arndt et al. 1987:250). Most Forest Service permits under which fox farms had been operated in Southeast Alaska were allowed to expire after 1945.

Documented Cultural Resources

Prior to 1994, the Alaska Heritage Resource Survey (AHRS), maintained by the Alaska State Historic Preservation Officer (SHPO), listed 7 prehistoric and historic period sites on Federally managed land within the Port Houghton/Cape Fanshaw EIS Project area. One of these sites, an unconfirmed petroglyph has previously been determined by the SHPO as "not eligible" for the National Register of Historic Places (Dilliplane 1983). With the exception of this latter site, all of the previously listed AHRS sites were relocated during the 1994 cultural resource investigations. Further documentation of known sites in 1994 identified a previously unrecognized prehistoric occupation (or occupations) in Port Houghton dating between about 3,500 and 1,000 years ago at which only a historic cabin site had been recorded. Also identified was a previously unrecognized shell midden deposit at Cape Fanshaw. Other previously known AHRS sites further documented in 1994 included a canoe run and historic cabin site, an historic fox farm district comprised of four related AHRS sites, and a Native campsite and cache pit which was radiocarbon dated to 250 +/- 30 B.P. (Cal. AD 1655).

Eighteen new AHRS sites and 2 AHRS historic districts were identified in the project area as a result of the 1994 cultural resource survey. A prehistoric shell midden deposit dated to 1280 +/- 50 (Cal. AD 1145) was documented and a Native fish weir dated to 110 +/- 40 (Cal. 1825-1835 or 1880-1915) was identified. A variety of historic sites representing early mining, trapping, and logging activities was identified in 1994. Structures and features associated with the Port Houghton Prospect, a copper mine worked prior to 1923, were documented at the head of Port Houghton. Two cabins were recorded at the Port Houghton Prospect and seven other cabin sites were documented for the first time in 1994. Two groups of associated fox farm structures were documented in 1994 as AHRS districts. One of these fox farm structures is comprised of a primary fox farm residence with three other related structures. On another island, two cabin sites associated with fox farming activity were recorded, along with a fox feeding station and other related features. Historic log dumps associated with evidence of past logging activity were also identified. Another historic site with pilings in the intertidal zone may have been a stationary fish trap site operated in the early 1900s. No burials, associated funerary objects, or Native American sacred objects were located during the 1994 survey.

Other cultural resources on State of Alaska managed land adjacent to the Port Houghton/Cape Fanshaw EIS Project area include a prehistoric site at the entrance to Port Houghton (Davis 1985), the historic fishing industry town site at Fanshaw Bay and two historic fox farm structures. In addition, culturally modified trees (CMTs), representing past Native use of the project area, are present along much of the coastline and on the larger islands. Springboard-notched stumps from historic logging activity are also common along much of the shore line in the project area.

Recreation (Issue 10)

The Port Houghton/Cape Fanshaw project area provides an opportunity to pursue recreational activities in a natural setting. A number of dispersed campsites and anchorages are distributed throughout the Port Houghton/Cape Fanshaw project area, but there are no developed recreational facilities, such as cabins or campgrounds, maintained by the Forest Service. The project area can be seen by recreational boats in Frederick Sound and Stephens Passage. The major features of the area are its natural landscape, and fish and wildlife populations for hunting and fishing.

Access

The Port Houghton/Cape Fanshaw project area is approximately 30 miles north and west of Petersburg, and about 80 miles south of Juneau. Because of its distance from communities, the area does not receive substantial use by residents. The area is accessible only by boat, helicopter, or float plane.

Recreational Opportunities

The Forest Service inventoried existing recreational opportunities on the Tongass National Forest using the Recreational Opportunity Spectrum (ROS). This ROS classification creates a structure for defining recreational experiences and opportunities. Seven ROS classes are identified for the Tongass National Forest: primitive, semi-primitive non-motorized, semi-primitive motorized, roaded modified, roaded natural, urban, and rural. Three of the seven ROS classes in the Tongass National Forest exist in the Port Houghton/Cape Fanshaw project area (Table 3-21 and Appendix I).

Table 3-21

Existing Acreage of Tongass National Forest Land Within the Project Area by ROS Class

ROS Class	Total Acres
Primitive	66,047
Semi-primitive Nonmotorized	53,964
Semi-primitive Motorized	16,896
Total	**136,907**

Source: Boyce 1995a

Primitive and semi-primitive non-motorized recreational experiences include a sense of being out in the forest by yourself, or with a few people in your group. Essential to this experience is the knowledge that there are no campgrounds, motorized vehicles, or roads in the area. Eighty-six percent of the project area acreage falls within these two ROS categories.

The Primitive area extends from the peaks in the interior portion of the project area, east around the Salt Chuck. There are also two isolated Primitive areas in the high peaks on the north boundary of the project area. The semi-primitive non-motorized area extends west from the Salt Chuck on both the north and south sides of Port Houghton, around the Sandborn Canal, and around Cape Fanshaw to Farragut Bay North Arm.

The area classified as semi-primitive motorized (SPM) in the project area is essentially the whole shoreline area from Farragut Bay North Arm around Cape Fanshaw to the Salt Chuck. This area also includes the small islands such as Robert and Whitney, and Storm Islands in the western portion of the project area. The SPM classification denotes an area that offers a predominately natural environment with a high probability of experiencing solitude, but the presence of motorized vehicles is not uncommon. In this specific instance, the area is essentially natural, but boats are seen and heard in Farragut Bay, Frederick Sound, Stephens Passage, and Port Houghton.

Recreational Places and Sites

Recreational places are geographic areas where recreation is known or thought to occur, and recreational sites are specific locations where features such as overnight anchorages or dispersed camping sites have been located.

For the purpose of discussion, the project area has been divided into four subareas (see project area map). Presently, 27 recreational places and 32 recreational sites have been identified in the project area. Table 3-22 includes the acreage, ROS class, and a brief description for each recreational place in the project area. This table includes recreational places within state-selected land not yet conveyed to the State of Alaska (Robert Islands and adjacent mainland). When conveyed, these recreation places will no longer be considered part of the Forest Service recreation inventory. There are no developed recreational facilities, such as cabins or maintained trails, in the project area. The Forest Service has identified 13 anchorages and 19 dispersed camping sites in the project area. The anchorages are distributed throughout the project area from Farragut Bay North Arm, around Cape Fanshaw and along the south shore of Port Houghton, into the Sandborn Canal, and into the Salt Chuck at the east end of Port Houghton. The majority of dispersed camping sites are near the Sandborn Canal or in the Salt Chuck. There is one dispersed camping site between the Farragut Bay North Arm and Cape Fanshaw.

Recreation Activities

Most recreation in the Port Houghton/Cape Fanshaw area appears to be dispersed along the southern shoreline of Port Houghton, in Sandborn Canal, and the Salt Chuck. Popular activities in the area include hunting, fishing, wildlife viewing, exploring shoreline areas, kayaking, and general sightseeing. Whales have been seen in Port Houghton, and bears are a relatively common sight along the shoreline. Seals have a rookery in the Salt Chuck, and the Rusty River and Glen

Table 3-22

Size, ROS Class, and Comments on Identified Recreation Places within the Port Houghton/Cape Fanshaw Project Area

Area	Area #	ROS	Acres	Comments
North Shore	6	P	1,163	Alpine/subalpine area around Alice Lake.
	11	SPNM	5,568	Steep slope, forested hillside above Port Houghton.
	24	SPM	74	Small sandy beach area, easy boat access, flat forest terrain behind beach.
	20	SPM	54	Waterfall within easy walk from shoreline. Easy boat access.
	14	SPM	253	Entrance to the Salt Chuck, shallow water boat access. One anchorage and one dispersed camping site.
	5	SPM	293	Mouth of the Rusty River, flat riverine environment. One anchorage and one dispersed camping site.
East Houghton	4	P	10,268	Forest contiguous to wilderness area - includes Rusty River and small lakes, partly in North Houghton area. One dispersed camping site[1].
	12	SPM	45	Flat beach area, easy boat access, mouth of river flowing down from lake. One anchorage and one dispersed camping site.
	13	SPM	2	Small island in the Salt Chuck with one dispersed camping site.
	16	SPM	198	Flat beach area at entrance to the Salt Chuck, east side of the mouth of Glen Creek, shallow water boat access.
	18	SPNM	430	Gently sloped area above the Salt Chuck.
	22	SPM	165	West side of the mouth of Glen Creek, narrow beach with steep, forested slopes. One anchorage site and one dispersed camping site[1].
	55	SPM	262	Beach area with steep, forested slopes, small pocket beaches. One anchorage site.
	63	SPM	1,662	Sandborn Canal, forested slopes. Two anchorages and four dispersed camping sites.
	60	SPM	12	Rabbit Island, one dispersed camping site.
	25	SPM	54	Walter Island.
North Fanshaw	61	SPM	807	Shoreline area on Port Houghton, small sandy pocket beaches, submerged reefs, challenging boat access. One anchorage site and one previously unidentified camping site[1].
	59	SPNM	18,779	Large forested area above Port Houghton with numerous small creeks, surrounds the Sandborn Canal.
	62	SPM	21	Small beach on forested Port Houghton shoreline.
	26	NA[2]	186	Largest of Robert Islands. One anchorage site.
	27	NA[2]	43	One of the Robert Islands.
	28	NA[2]	17	One of the Robert Islands.
	29	NA[2]	7	One of the Robert Islands.
	30	NA[2]	55	Flat beach area near Fort Point, submerged reefs. One dispersed camping site.
	33	SPM	308	Flat beach area near Fort Point, submerged reefs. One dispersed camping site.
South Fanshaw	43	P	5,761	High forested area around Jamestown Peak.
	46	SPNM	3,134	High forested area around Tangent, Man-of-War, Alaska, and Saranac peaks.

[1] A detailed description of the dispersed camping sites found by archaeologists is provided in Bowers et al. (1995a). This table only includes the areas within recreation places. Additional recent use areas are also described in Bowers et al. (1995a).

[2] State-selected lands not yet conveyed.

Source: Boyce 1995a

Creek near the Salt Chuck area have salmon runs that provide preferred recreational fishing opportunities. The Rusty River is the only stream in the project area known to have a significant sockeye run.

Many boats were observed traveling through the Frederick Sound/Stephens Passage area, and some recreational boats were seen anchored inside of Whitney Island. Most boats seen in Port Houghton were commercial fishing boats. The lack of recreational boats seen in Port Houghton may also be due to the absence of reliable bathymetric information on current nautical charts for the area. Sandborn Canal is the popular anchorage in the area.

Other factors that may be influencing the level of use in this area is the substantial distance of the project area from the established communities of Juneau and Petersburg (approximately 32 miles from Farragut Bay North Arm), lack of developed recreation facilities, and a visual landscape (excluding the Salt Chuck area) common in Southeast Alaska. Most residents choose to spend their recreation time in areas that can easily be reached and returned from in a weekend. This concept creates a radius between 15-30 miles around communities where most recreation takes place. While there is no precise definition of "home range," 20 miles is thought to be the estimated furthest distance a skiff could travel from and back to a community in the daylight and still use a Recreation Place.

As per the 1994 Chatham Management Area Outfitter and Guide Actual Use Report, dated March 17, 1995, three guides have been permitted to use the Port Houghton area. The information collected has been reported by the number of nights spent in the bay and the type of activity being provided. Three operators spent 12 nights in the bay area. Nine of these stays were for big game hunting and three were for sightseeing.

The Forest Service estimates two people per hunt (numbers do not include guide or outfitter) and four to six people per sightseeing trip.

With these numbers, some conclusion could be drawn as far as outfitter and guide use of the Port Houghton area. This information does not include any of the permits that have been granted by the other Areas (Stikine and Ketchikan).

The Port Houghton shoreline is a mixture of rocky shoreline areas, with small sandy beaches distributed throughout the area. A waterfall, accessible by boat from Port Houghton, can be found along the northern shoreline. The entrance to the Salt Chuck provides visitors on boats with a striking experience as the water moves close to a vertical rock wall while the boat navigates the S-shaped entrance with shallow submerged reefs. The Frederick Sound shoreline from Farragut Bay to Cape Fanshaw provides a long, exposed beach with expansive views to the south. The shoreline between Cape Fanshaw and the entrance to Port Houghton includes a series of shoreline areas that have a more intimate feel to them because

of the nearness of islands located just offshore. A long, sandy beach just north of Cape Fanshaw looks out on the Storm Islands. The rocky Cleveland Passage shoreline offers views across a narrow water body to a forested Whitney Island. Further north, the Steamboat Bay shoreline forms a "U" around Foot Island.

Some bear hunting occurs in the spring along the shoreline, and in the fall on creeks with anadromous fish runs. Goat, deer, and moose hunting also occurs in the project area. Recreational fishing opportunities are primarily for salmon and halibut but also include shellfish in Port Houghton. Salmon fishing also occurs in Sandborn Canal and associated tributaries, as well as Negro Creek, Glen Creek, and the Rusty River in the Salt Chuck. One local charter float plane company in Petersburg estimates that they make about 15 flights per year into the Port Houghton area carrying 2 to 3 people per trip for hunting activities. These hunters are hunting primarily for bear and moose in the Sandborn Canal and the Salt Chuck/Rusty River areas. Roughly 40 percent of the flights are directly into the Sandborn Canal area for bear hunting. Some residents of Hobart Bay to the north of the project area use the Salt Chuck area for waterfowl hunting. In addition to hunting activities, an active trapline is being maintained on Robert Islands in the winter, and about six flights are made into this area every winter.

The Alaska Marine Highway ferries travel through Frederick Sound, and passengers can view portions of the project area. Smaller recreational boats also use Frederick Sound for north-south travel, and as a destination for whale watching.

Roadless Areas

The Forest Service evaluated all roadless areas in the Tongass National Forest for their potential inclusion into the Wilderness system. The project area includes portions of roadless area 201 (Fanshaw 48,751 acres) and roadless area 308 (Windham-Port Houghton 165,876 acres). The only existing road system in the project area is a road serving Hobart Bay logging activity on Goldbelt, Inc. land on the north shore of Port Houghton. The Forest Service has easement rights to use this road for timber haul. The Tracy Arm-Fords Terror Wilderness area is adjacent to the eastern boundary of the project area. Although the roadless character of the project area is an important part of the recreational experience of the area, it is not uncommon in Southeast Alaska.

Visual Resources (Issue 11)

The Port Houghton/Cape Fanshaw project area is in the Coast-Range Visual Character Type (USDA-FS 1979b). This type encompasses the mainland of Southeast Alaska from Skagway south to Cape Fox at the international boundary (an area approximately 350 miles long and 40 miles wide). The project area is characteristic of the Coast-Range visual type: ". . . scale of landforms are generally large, massive and give an impression of great bulk. Uplands are . . .

dissected by deep steep-walled U-shaped valleys. Mountain ridges are generally rounded summits but are surmounted, at times, by aretes and horns. . . . The large saltwater fjords protruding into this character type are sometimes extremely steep-sided, affording great visual relief because of the abrupt differences in elevation" (USDA-FS 1979b).

The land mass of the project area lies on either side of Port Houghton or on the peninsula defined by Frederick Sound and Port Houghton. The land rises quickly from sea level to alpine elevations of 3,000 to 5,000 feet.

Port Houghton is a large saltwater fjord. A traveler headed inland on the small boat route through Port Houghton would pass through a series of topographic chambers. At the mouth, Port Houghton is a large broad bay with an open, exposed feeling. On the north is Point Hobart which displays a large timber clearcut on private land. Sandborn Canal is a narrow, protected channel appended to Port Houghton's southern shoreline. East of Sandborn Canal, Port Houghton becomes narrow, and the landform seems to tower over the water surface. Deeper inland, a broad level terrace nearly blocks the channel, reducing the fjord to a narrow, shallow river-like channel. At the end, Port Houghton suddenly opens again to a deep waterbody called the Salt Chuck. The trip from the mouth of Port Houghton to the end of the Salt Chuck is about eighteen miles in length. In a small boat, the trip could take from forty-five minutes to an hour or more depending upon the tidal current.

Western hemlock-Sitka spruce forest almost uniformly covers the project area. The exceptions are (1) alpine meadows on high peaks, (2) scattered rock outcroppings and cliffs, (3) clearcut on private land and (4) muskegs. Vertical "stripes" modulate the green canopy. These apparently result from younger forest growing on old landslide chutes. From Frederick Sound, the vegetation presents a mottled pattern created by a variety of growing conditions.

Maritime atmospheric conditions significantly influence views of the project area. Low clouds cover Southeast Alaska about 310 days a year. The clouds are frequently near or at sea level; consequently, landscapes may be partially obscured from viewing most of the time. The 55 or so potentially clear days generally occur during summer months when visitors are likely to tour the area. Even on regionally clear days, visibility may still be highly variable in the project area. Dense fog may cover the shoreline at Cape Fanshaw, yet at the same time, the sun could be shining in a clear sky over Sandborn Canal.

Viewing Locations and Conditions

People are most likely to see the Port Houghton/Cape Fanshaw project area on a short-term, temporary basis. No permanent human communities view the area. The closest community is a logging camp in Hobart Bay. No roads cross the area, except for logging roads serving Hobart Bay. No one experiences the visual conditions as part of a daily work commute.

Viewers are likely to be either seasonal workers (logging, fishing, shellfish, subsistence hunting, guides); regional residents traveling between communities on the state ferry system; or recreationists (touring on the ferry or in a small boat, whale watching, recreational hunting or fishing).

The largest potential viewing public is aboard the Alaska Marine Highway. Two ferry routes pass by the site: (1) the Juneau to Petersburg route and (2) the Sitka to Petersburg route. Approximately 84,150 people travel on these routes annually (Rufenstein 1994 personal communication).

People aboard small boats, whether for commercial fishing or recreation, are the second largest potential viewing public. At present, there appears to be no verifiable statistics on the number and frequency of this type of visitor to the project area. Field researchers observed numerous commercial fishing and crabbing boats in Port Houghton and around Cape Fanshaw. However, this is an extremely limited sampling and cannot be used as evidence of the potential number of viewers. Port Houghton is relatively remote from Petersburg (the nearest sizable community). By boat, a trip from Petersburg could take several hours. As a result, recreational sites and scenic landscapes closer to Petersburg may deflect visitors who would otherwise travel to the project area. Public comment at scoping meetings indicates that: (1) guides and floatplane operators in Petersburg do transport individuals to the project area for recreation; and (2) residents of the Hobart Bay logging camp use Port Houghton (the Salt Chuck, in particular) for recreation. Currently, there are about a dozen seasonal dwellings in Farragut Bay. The occupants have limited views of the project area and could likely use the project area for recreation.

The project area has potential for attracting visitors with an interest in high visual quality. Large numbers of humpbacked whale summer in Southeast Alaska; many spend substantial time at the mouth of Port Houghton. Public comment to the Forest Service indicates that the area around Five Finger Islands, directly west of Port Houghton, is a reliable and popular whale watching location. Also, a number of undeveloped recreational sites and anchorages exist in Port Houghton and Farragut Bay. Small boats find sheltered anchorage in North Arm, Sandborn Canal, Cleveland Passage (between Whitney Island and the mainland) and the passage between Robert Island and the mainland. Port Houghton itself tends to be too exposed or too deep for small boat anchorage. In extreme storms, Sandborn Canal offers the highest degree of protection.

The State of Alaska owns land on the east shore of Cleveland Passage, the south tip of Whitney Island, Robert Island and on the mainland south of Robert Island. Earlier this century, Cleveland Passage was the site of a small town, and Robert Island was a private fox farm; the area has been unoccupied since the 1950s. Researchers could not confirm definitive plans for the disposition of the State select land. Apparently the State has considered residential lots along Cleveland

Passage and a marine park at Robert Island (Hamberg 1994 personal communication). Both would attract more visitors with an interest in high visual quality to the Port Houghton/Cape Fanshaw project area.

Project Area Visual Priority Routes and Use Areas

For the Port Houghton/Cape Fanshaw project area, the primary view locations are (in order of priority, highest priority first):

- views from the Alaska Marine Highway (Alaska State Ferry) in Frederick Sound and Stephens Passage,
- views from the small boat route into Port Houghton, and
- views from anchorage and recreational sites in the project area.

Small boats may be present at a variety of locations within Port Houghton, although small boats tend to travel along the northern shoreline of the bay because the south shoreline is shallower with a number of uncharted rocks below the waterline.

The tour ships that cruise through Stephens Passage generally pass closer to Admiralty Island than does the Alaska Marine Highway (more than 10 miles from the project area). From this westerly route, people cannot see detail in the project area, excepting patterns of light and dark that reflect cut and uncut areas. Tour ships further east would view the project area as if from the Alaska State Ferry System.

Views from air routes are not a priority in the evaluation of visual resources in the project area. First, large commercial airlines fly at cruising altitude above the project area; visual conditions would not be readily apparent to passengers. Second, small planes fly over the project area on a sporadic basis and in shifting traffic patterns.

Project Area Viewsheds

Travel routes and topography define ten major viewsheds in the Port Houghton/Cape Fanshaw project area. Major viewsheds are landscapes that people can see as a single unit, although not all of the area within a viewshed may be seen from all of the viewpoints. Figure 3-6 shows the project area viewsheds and viewpoints/photopoints.

Farragut Bay Viewshed

In the Farragut Bay Viewshed, people see the project area in the middle- to background from a distance of about four to eight miles. Viewers are likely to be occupants of seasonal dwellings and small boat users (commercial and recreational). The shorelines and a large outwash plain are accessible and offer a variety of views to the project area. An intervening ridge blocks lower elevations of the project area which appears as a series of rounded, tree-clad ridges. The viewshed appears natural, untouched by human activities. This viewshed is seen from Viewpoint S-1 (Appendix G and Figure 3-6).

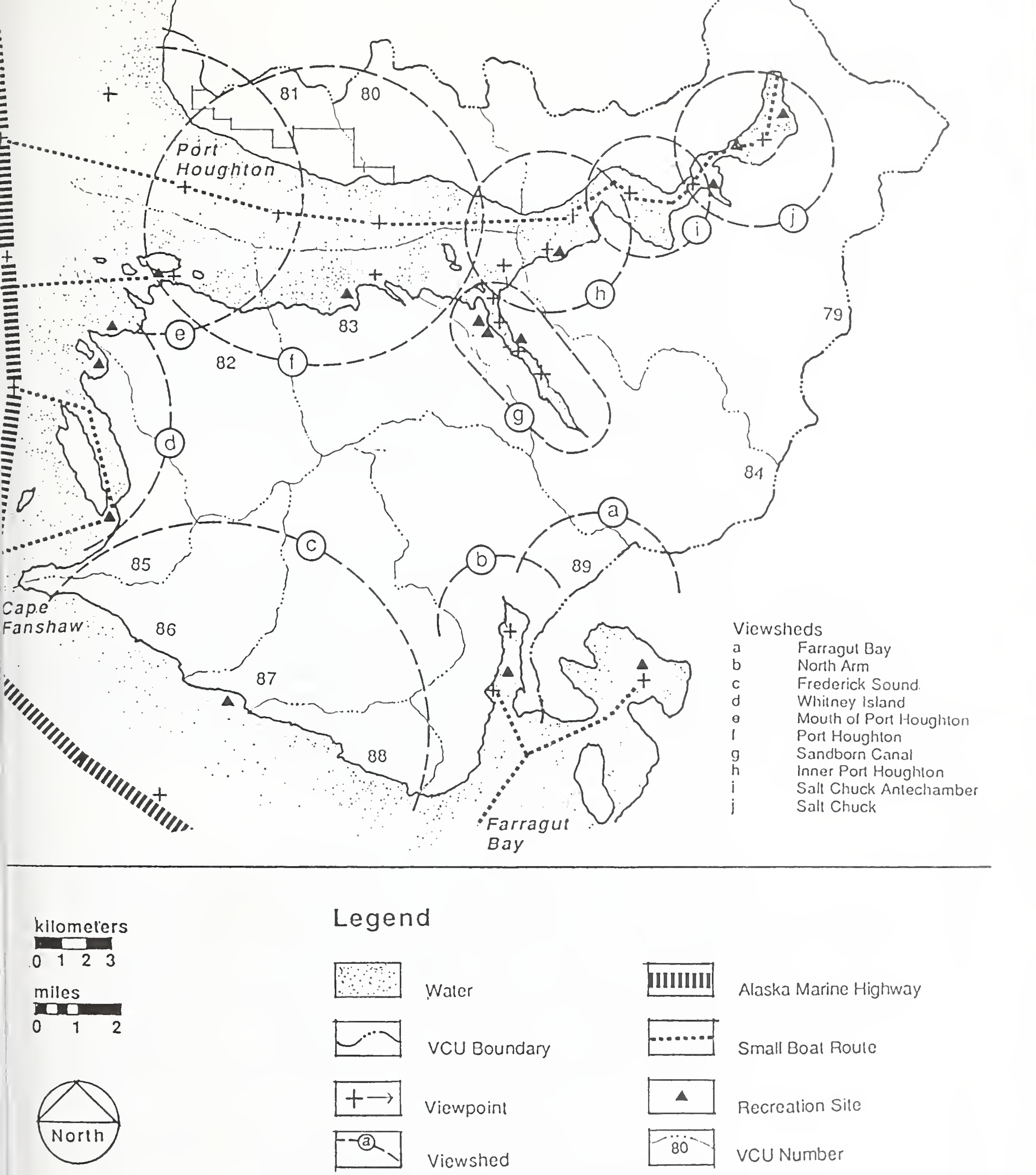


Figure 3-6.
Viewsheds for the Port Houghton/Cape Fanshaw project area

North Arm Viewshed

In this viewshed, people see the project area in the fore-, middle- and background from the water surface and shoreline of the North Arm of Farragut Bay. Viewers are likely to be in small boats (commercial and recreational). The shorelines are accessible. The North Arm has two small tidal flats that might be desirable recreational spots: one at the end of North Arm and a second on the west shoreline, just inside the mouth. Dense trees at the shoreline dominate the foreground view. Rounded, uniformly tree-covered hills rise in the middleground behind the shoreline trees. From some viewpoints, the middleground hills have a backdrop of high rocky ridges with snow patches (in August). The viewshed appears natural, untouched by human activities. This viewshed is seen from Viewpoints S-2 (Appendix G) and S-3 (Appendix G).

Frederick Sound Viewshed

In this viewshed, people see the project area from Alaska Marine Highway about three to four miles offshore. Small boat users are also likely to view the project area at varying distances from the shoreline. The shorelines are generally accessible, but lack the protection needed for reliable anchorage. At the shoreline, foreground trees dominate the view. From further offshore, deeply folded and steep topography fills the middleground. Rocky, alpine peaks dot the background. Viewers see a mosaic of modulated greens and browns resulting from a variety of growing conditions caused by steep slopes, microclimate and soil conditions. The viewshed appears natural, untouched by human activities. This viewshed is seen from Viewpoint S-4 (Appendix G and Figure 3-6).

Whitney Island Viewshed

Whitney Island lies about midway between Cape Fanshaw and the mouth of Port Houghton. In this viewshed, people see the project area from the Alaska Marine Highway about three miles offshore of Whitney Island. Small boat users see the project area from varying distances from the shoreline. Cleveland Passage, between Whitney Island and the mainland, is a small boat route. Viewers at the shoreline see foreground trees. A long, rounded ridge curves along the shoreline; its uniformly green, tree-covered slope dominates the middleground view from the Marine Highway. To the north, snow-capped peaks deep in Port Houghton form a backdrop. Point Hobart is at the extreme northern limits of the Whitney Island viewshed. The Point Hobart clearcut on private land is visible in the background, but at such a distance that it appears only as patterns of light and dark. Since all other slopes in the vicinity are tree-covered from shore to ridge, the average viewer is likely to suspect that the change in coloration is due to human activities. In spite of this, the dominant image of the viewshed is natural. This viewshed is seen from Viewpoint C-1 (Appendix G and Figure 3-6).

Mouth of Port Houghton Viewshed

From small boats and the Alaska Marine Highway, people see the mouth of Port Houghton as exposed and expansive. Whale watchers in the vicinity of The Five Fingers would observe this viewshed. Distant snow-capped peaks topping blue-gray ridges fill the center of the view. Rounded dark-green hills frame the south shore; Point Hobart is on the north shore. Viewers can recognize Point Hobart's clearcut on private land as human-caused activity, especially from northern viewpoints. The remainder of the area appears natural. This viewshed is seen from Viewpoints C-2, C-3, and C-4 (Appendix G and Figure 3-6).

Port Houghton Viewshed

Viewers on the small boat route in Port Houghton have a 360 degree view of a broad, open bay. On the north, the landform rises abruptly to rounded summits, topped in the background by steep peaks. The south side of Port Houghton is shallower, with many tiny islands and poorly charted rocks beneath the water surface. On this side, large, sea-level terraces are in the foreground; dark-green, steeply undulating hills are pushed to the middle- and background. Dahlgreen Peak (a pointed, rocky summit) forms a focal point at the center of the southern shoreline. The large clearcut on private land is readily apparent to the viewer; people can see details such as rock pits and slash. The human-caused visual changes dominate the views to the north. The remaining viewshed appears natural, untouched by human activity. This viewshed is seen from Viewpoints C-5, C-6, C-8, and C-9 (Appendix G and Figure 3-6). Detail on the south shore can be seen from Viewpoints C-6 and C-9.

Sandborn Canal Viewshed

Sandborn Canal is a long, narrow channel draining the Sandborn River. In this viewshed people on the water surface and shoreline see the project area in the fore-, middle- and background. Sandborn Canal offers ample anchorage and landing sites to small boats (commercial and recreational). Ridges line the sides of the channel. Steep viewing angles and foreground trees block extensive views of the project area. The landscape seems very close and intimate. At the end of Sandborn Canal, the topography channels views, focusing attention on uniformly green hills in the middle- and background. This viewshed is seen from Viewpoints C-10, C-11, C-12 and C-13 (Appendix G and Figure 3-6).

Inner Port Houghton Viewshed

East of Sandborn Canal, the vastness of Port Houghton diminishes to be replaced by a sense of enclosure. The landform on all shorelines grows steeper, substantial, and lofty. Alpine meadows and exposed rock peaks top the horizon. Uniform dark green forest covers the lower slopes, except in areas of rock

outcroppings. Viewers are likely small boat users. Rocky and steep shoreline limits accessibility in some areas, particularly on the northern shoreline. The viewshed appears natural, untouched by human activity. This viewshed is seen from Viewpoints C-14 and C-16 (Appendix G and Figure 3-6).

Salt Chuck Antechamber Viewshed

As a viewer on the small boat route through Port Houghton moves deeper into the fjord, the north shore grows steeper into cliffs with cascades and rugged, exposed rock. The south shoreline also rises more sharply, so that the sense of enclosure grows increasingly stronger as the traveler passes through the winding channel. In this viewshed, the mouth of Port Houghton is lost to sight. To the east, a tree-covered sea-level terrace, fronted by a tidal flat, appears in the foreground. At this point, the fjord becomes very shallow and river-like with concentrated and swift tidal currents. Viewers can perceive the detail on the rugged and rocky northern shoreline. The viewshed appears natural, untouched by human activity. This viewshed is seen from Viewpoints C-17 and C-18 (Appendix G and Figure 3-6).

Salt Chuck Viewshed

At the end of the small boat route, Port Houghton abruptly expands to a wide loch gently curving through massive hills. Rocky alpine ridges ring the background. Although very large, the landscape in this viewshed is also insular. The sounds, wind, and wave action of the outer bay are completely absent. Dark green forest covers the landscape, except for rock outcroppings and alpine meadows. People view the landscape in the fore- middle- and background from the surface of the water and shorelines. A number of small islands offer landing sites. The viewshed appears natural, untouched by human activity. This viewshed is seen from Viewpoint C-19 (Appendix G and Figure 3-6).

Visual Management Components

Visual Quality Objectives

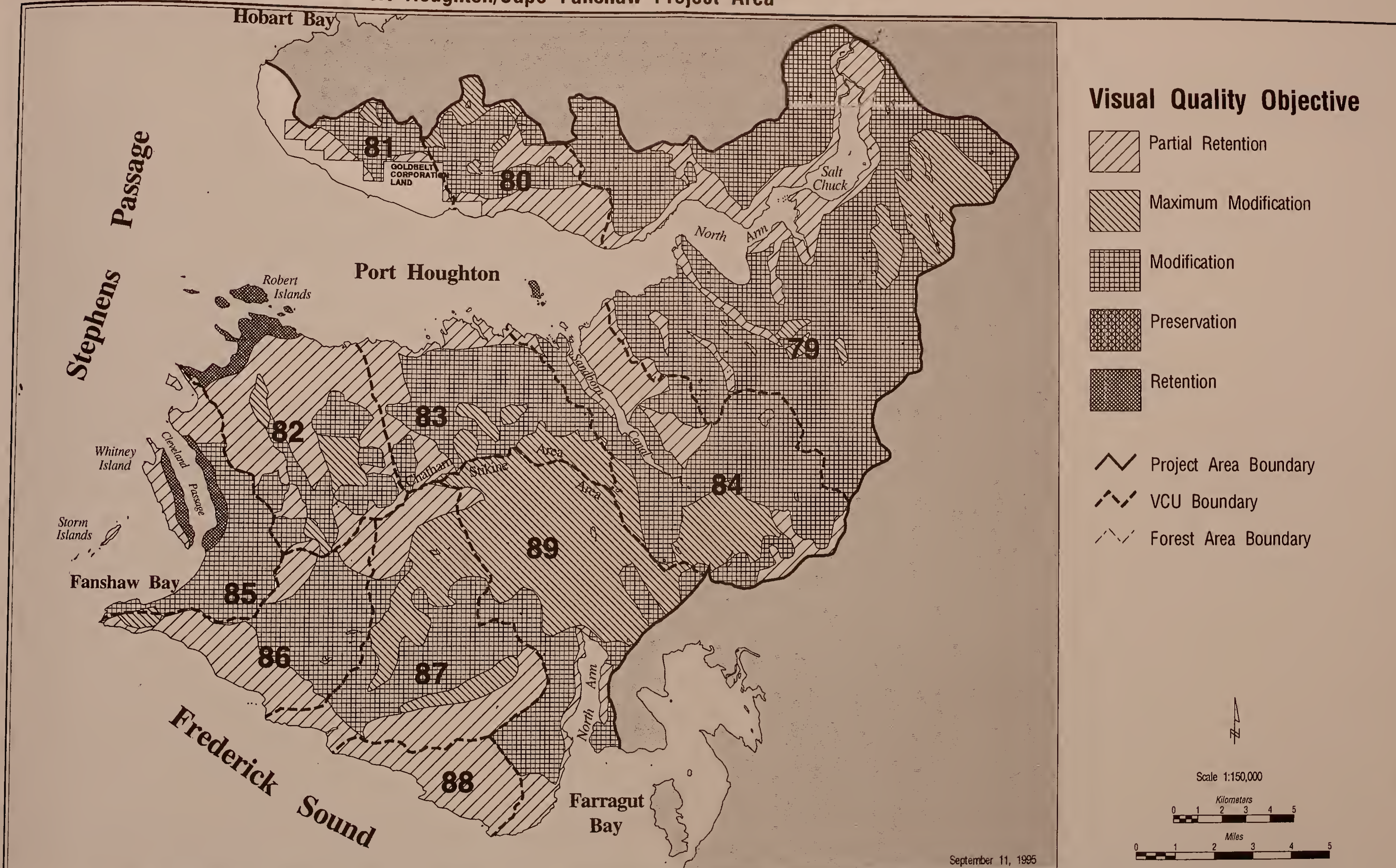
VQOs are measurable standards for visual management of the project area. The objectives describe both visual resource goals and levels of variation from the characteristic landscape caused by management activities. In the project area, Visual Quality Objectives are inventoried, not adopted, standards. Figure 3-7 shows the Visual Quality Objective zones within the project area, including Preservation, Retention, Partial Retention, Modification and Maximum Modification. The Visual Quality Objectives are described below.

Preservation

This Visual Quality Objective allows for ecological changes only. Management activities, except for very low visual impact recreational facilities are prohibited. The project area has no areas with the VQO of Preservation.

Figure 3-7

Visual Quality Objectives in the Port Houghton/Cape Fanshaw Project Area



Retention

This Visual Quality Objective provides for management activities that are not visually evident. The Retention VQO would be met if the average person could not detect any sign of a management activity in the foreground without having it pointed out.

The area around Robert and Whitney Islands is common to the Coast-Range character type, but has a high sensitivity level and people see the area in the foreground. Therefore, Retention is the Visual Quality Objective. The Retention areas are in the Whitney Island and Mouth of Port Houghton viewsheds.

Partial Retention

This Visual Quality Objective provides for management activities that remain visually subordinate to the characteristic landscape. The Partial Retention VQO would be met if the average person could detect the presence of a management activity without having it pointed out, but that the activity would not have enough contrast to become a focal point when viewed from a middleground distance. When viewed from background distances, the same management activity should not be evident. Reduction of activity impacts should be accomplished within a year of project completion.

In the project area, landscapes common to the Coast-Range that have a high sensitivity level and are viewed in the middleground are generally classified with a Partial Retention VQO. In addition, landscapes that have a lower sensitivity level, but are viewed in the foreground or have high visual Quality also have the Visual Quality Objective of Partial Retention. All viewsheds in the project area have some areas classified as Partial Retention. The Frederick Sound/Stikine, Mouth of Port Houghton and Port Houghton viewsheds have the highest percentage of Partial Retention, most likely because people see those from both the Alaska Marine Highway and from small boats. In other viewsheds, steep slopes (that people can see in the background from the Alaska Marine Highway) and shorelines are zoned Partial Retention.

Modification

This Visual Quality Objective provides for management activities that dominate the view but retain the characteristics of the surrounding characteristic landscape. Under this VQO, the average person viewing a management activity in the foreground would have no doubt that the activity is visually dominant. When viewed in the middleground, the same activity could be a focal point, but the form, line, color and texture reflects the surrounding characteristic landscape. When viewed from the background, the management activity may be evident, but should no longer be a focal point. Reduction of activity to meet this objective

should be accomplished in the first year in the foreground and within five years in the remaining seen area.

Most of the project area (52 percent) has a Modification Visual Quality Objective. The Modification landscapes are generally viewed in the middle- or background and have average sensitivity and minimal landscape variety.

Maximum Modification

This Visual Quality Objective provides for management activities that dominate the characteristic landscape. Under this VQO, the average person would see a management activity in the foreground and middleground as visually dominant. When viewed in the background, the same activity may be a minor, but not a major, focal point in the viewshed. Reduction of activity impacts to meet this objective should be accomplished within five years.

Landscapes that people cannot see from the water or can see from only limited locations generally have the Visual Quality Objective of Maximum Modification. Because most Maximum Modification areas are not seen, only the North Arm viewshed has areas with this Visual Quality Objective. As the name implies, Maximum Modification is a Visual Quality Objective that allows management activities to dominate the landscape.

Existing Visual Condition

Existing Visual Condition (EVC) identifies the evident level of change from the characteristic landscape. The Forest Service R-10 Landscape Management Handbook uses six designations to describe landscapes ranging from untouched to highly modified (Types 1 through 6).

At present and when inventoried for the Visual Resource Data Base, the project area appears mostly natural and untouched by human activities. This constitutes a Type I Existing Visual Condition. At the viewshed level, this rating does not account for “spill-over” visual effects. In the Mouth of Port Houghton and Port Houghton viewsheds, most of the landscape is classified as Type I EVC. However, the visual condition of both viewsheds is strongly influenced by the existing clearcut on private land. In other words, the southern shoreline may appear untouched, but because people can see it in the same viewshed as the clearcut, the general impression is one of a modified landscape.

Economics (Issue 12)

Southeast Alaska Regional Economy

In Southeast Alaska, industry depends almost entirely on the natural resources of the Tongass National Forest. Subsistence, fishing, tourism, recreation, timber harvest and mining activities primarily occur on National Forest lands. As a

result, the natural resources and use of the Tongass National Forest are important considerations for all residents.

Historically, the important industries to Southeast Alaskans are forestry, fishing, hard rock mining, and tourism which has been growing in significance over the last 10 years. The oil industry affects all Alaskans directly and indirectly, and is the major revenue source for the state. The forest industry is expected to contract rather than expand in the future, while decreasing stocks of wild fish are also predicted to affect the fishing industry.

Tourism is expected to be the most promising private industry in Southeast Alaska. Although the tourism industry may employ many Alaskans, the industry is primarily controlled by non-Alaskan companies. In comparison to the continental United States, Southeast Alaska remains an expensive tourist destination due to the cost of transport to and from the state, and among islands within Southeast Alaska. Use of cars is limited and recreational opportunities such as sport-fishing, boating and hiking are expensive due to the cost of transport and need for guides. The industry as a whole suffers from boom/bust cycles caused by dollar fluctuations, world politics and shifting trends in tourist interest (Alaska Department of Labor 1992), as well as the economic conditions of the lower 48 states and abroad. As destinations abroad become more expensive or politically dangerous, more tourists are attracted to vacations within U.S. territories.

The economic outlook for the mining industry is dependent on the Greens Creek silver mine near Juneau and proposed mines by Echo Bay, as well as changing metal prices and supply throughout the world (Alaska Department of Labor 1993).

Port Houghton Region of Influence Within Southeast Alaska

The primary region of influence is the area whose population would sustain the largest socioeconomic impacts resulting from implementation of proposed timber harvest alternatives in the Port Houghton/Cape Fanshaw project area. For purposes of this analysis, and based on regional expenditures, consumption, and residential characteristics; four major communities have been designated as the primary region of influence. These communities are Juneau, Petersburg, Wrangell, and Kake. The major economic resources of the region of influence include recreation, fish, and timber. Up to seven local Southeast Alaska communities may derive benefit from the proposed timber harvest due to the sawmills present in these communities.

Although use of the area for recreation and subsistence additionally includes the Hobart Bay logging camp, few statistics are available for this area. Use of the project area by the Hobart Bay logging community is dependent on timber harvest occurring in Hobart Bay. The community is temporary and personnel are expected to exit the area when the logging is completed—around 1997, although opportunity exists for developing the road and camp for tourist facilities.

Employment of the logging camp is entirely for harvesting timber on Goldbelt, Inc. lands. Use of the project area is confined to subsistence. Although a variety of subsistence resources is obtained from the project area by Hobart Bay residents, the amount of catch is not substantial because of the lack of personal refrigeration at the logging camp and the provision of all meals by the camp caterers.

Economic Use of the Forest

Timber Industry

The timber industry faces an uncertain future and overall employment is projected to decrease. This is in contrast to the 1980s when the number of logging jobs grew by more than 80 percent and demand was high. Timber from private lands contributed greatly to the increase in the timber industry in the 1980s. High prices kept operations profitable, and the market allowed harvest and production levels to nearly double during this decade. The future health of the timber industry in Southeast Alaska is tied to the international market over which Alaskans have minimal control. The supply of raw materials and the market for finished products are the critical factors affecting the future of the industry (Alaska Department of Labor 1991).

Most of Alaska's future timber harvest activity is expected to occur within the Tongass National Forest. Where some harvestable timber exists on other federal lands of the state, harvest from these areas is relatively minor. Alaska Native regional and village corporations own most of the private timber base. These corporations have harvested a large portion of their holdings, and logging is expected to decline and decrease as their timber resources diminish.

The accelerated harvest of timber from private lands contributed greatly to the increase in timber industry in the 1980s. In contrast, timber within the National Forests is managed through long-term sustained yield ensuring a continued timber supply over time (Alaska Department of Labor 1991).

Timber harvest in Southeast Alaska since 1981 has fluctuated from a low of 520 MMBF (1981) to a high of 989 MMBF (1989), with a yearly average of 709 MMBF. This volume includes the Tongass National Forest, state lands, Bureau of Indian Affairs-administered lands, and private lands. Timber harvest in the Tongass National Forest has fluctuated since 1981 from a low of 232 MMBF in 1985 to a high of 471 MMBF in 1990 (Table 3-23). Recent information for 1994 shows that a total of 276 MMBF was harvested, the lowest amount since 1985. Average yearly volume has been 346 MMBF. Harvest has declined since 1991 (see Table 3-23). The value of international exports of Alaska forest products averages at $518 million dollars for the years 1987 to 1991, with logs accounting for most of this value (Table 3-24). The Tongass National Forest contributed 46 percent of the total timber harvested in Southeast Alaska between 1989 and 1991 with the remaining timber being harvested from Native lands and exported as unprocessed sawlogs (USDA-FS 1993a).

Table 3-23

Timber Harvest on the Tongass National Forest, 1981-1994

Fiscal Year	Volume Type	Million Board Feet Harvested	Fiscal Year	Volume Type	Million Board Feet Harvested
1981			**1987**		
	Sawlog	339.5		Sawlog	282.0
	Utility	47.8		Utility	54.2
	Total	**387.3**		**Total**	**336.2**
1982			**1988**		
	Sawlog	326.6		Sawlog	331.5
	Utility	43.8		Utility	64.7
	Total	**370.4**		**Total**	**396.2**
1983			**1989**		
	Sawlog	220.0		Sawlog	377.0
	Utility	30.0		Utility	67.6
	Total	**250.0**		**Total**	**444.6**
1984			**1990**		
	Sawlog	226.7		Sawlog	399.0
	Utility	34.0		Utility	72.0
	Total	**280.7**		**Total**	**471.0**
1985			**1991**		
	Sawlog	162.5		Sawlog	299.6
	Utility	69.5		Utility	64.6
	Total	**232.0**		**Total**	**364.2**
1986			**1992**		
	Sawlog	251.4		**Total**	**370**
	Utility	39.1	**1993**		
	Total	**290.5**		**Total**	**325**
			1994		
				Total	**276**
			Yearly Average		
				Sawlog	292.3
				Utility	53.4
				Total	**345.7**

Sources: 1989, 1990, and 1991 ANILCA Section 706(a) Tongass Timber Supply and Demand Reports, USDA-FS 1995, and Gunther 1995b.

Table 3-24
Value of International Exports of Alaska Forest Products, 1987-1994

Fiscal Year	Product	Millions of Dollars	Fiscal Year	Product	Millions of Dollars
1987			**1992**		
	Logs	179.6		Logs	327.4
	Lumber	33.9		Lumber	50.3
	Chips	0.0		Chips	1.5
	Pulp	113.9		Pulp	175.0
	Total	327.4		Total	554.2
1988			**1993**		
	Logs	261.6		Logs	362.6
	Lumber	52.1		Lumber	74.4
	Chips	.6		Chips	4.3
	Pulp	160.4		Pulp	123.3
	Total	474.7		Total	564.6
1989			**1994**		
	Logs	310.3		Logs	343.8
	Lumber	71.0		Lumber	67.7
	Chips	3.6		Chips	8.2
	Pulp	227.7		Pulp	90.1
	Total	612.6		Total	509.8
1990			**Yearly Average**		
	Logs	350.9		Logs	303.8
	Lumber	85.3		Lumber	63.7
	Chips	1.4		Chips	3.4
	Pulp	203.4		Pulp	157.0
	Total	641.0		Total	527.9
1991					
	Logs	293.9			
	Lumber	74.8			
	Chips	7.3			
	Pulp	162.2			
	Total	538.2			

Source: Cheshire 1991, and Gunther 1995b

The demand for Alaskan forest products is based on foreign and domestic competition, currency fluctuations, tariffs, economic considerations in major consuming nations, and import restrictions associated with international trade. The unique qualities of Alaskan forest products that influence demand are the old-growth fine-grained Sitka spruce and hemlock logs which are highly prized in Asian markets. The softwood chips used in pulp and pressboard products are relatively common throughout the world, and price is controlled outside of Southeast Alaska (Alaska Department of Labor 1991).

<ins>Demand for Southeast Alaska Timber</ins> - Japan is an important purchaser of Alaskan wood products along with China, Indonesia, and Taiwan. For 1994, 78 percent of Alaska's market pulp exports were sold to these countries (USDA-FS 1995a). Demand has decreased slightly since 1989 due to stockpiling by the Japanese during the spotted owl controversy in the Pacific Northwest. Other

markets for Alaska's wood products include Taiwan, Korea, and China. Other countries around the world are also targeting the Asian market, although the primary competitor for Alaska's products is Canada (Alaska Department of Labor 1991). The economic conditions in major consuming nations will also affect the demand for Alaska's wood products.

Dissolving pulp is primarily used in the manufacture of rayon. Although the demand for rayon has increased, rayon is considered a luxury with an unstable demand (Alaska Department of Labor 1991).

Western red and Alaskan yellow cedar in the National Forest are considered a surplus to domestic production, making them available for roundlog export. By lifting the surplus designation, these cedars would adhere to the same export and primary processing restrictions as western hemlock and Sitka spruce. In-state cedar processing has the potential for increasing supply levels of all cedar mills in Southeast Alaska (Alaska Lumbermen's Association 1994).

Currency exchange rates have also influenced the timber market. A decrease in the value of the dollar affects the demand for all Alaskan products including timber, because these products will become cheaper, and worldwide demand will thus increase. In contrast, a strong dollar may result in more worldwide competition as products from other countries become comparatively cheaper elsewhere (Alaska Department of Labor 1991).

Timber Sales Program - The Tongass National Forest timber sales program was divided into two components: the 50-year long-term contracts and independent sales. The independent sale program could be further divided into open sales and Small Business Administration (SBA) set-aside sales. The fifty-year contracts were held by the Alaska Pulp Corporation (APC) and Ketchikan Pulp Corporation (KPC). These two pulp mills produced about 28 percent of the total U.S. value for dissolving pulp and 6 percent of the world volume in 1989.

On September 30, 1993 the APC pulp mill in Sitka was closed indefinitely. As time progressed, the company stated that it was going to explore the possibility of changing the mill to a medium density fiberboard (MDF) plant. Because the contract requirement for the pulp mill was breached, the Forest Service terminated the APC long-term contract on April 14, 1994. Unlike other termination actions, an orderly closeout of operations was allowed; most timber sale operations were completed by the fall of 1994. This allowed for the continued operation of the Wrangell sawmill which subsequently closed in November 1994.

In 1977, the Forest Service and the SBA established an annual set-aside program of approximately 80 MMBF of timber from the Tongass National Forest as part of the short-term timber sales program. Since 1980, an average of 82 MMBF of timber has been offered annually through this set-aside program (USDA-FS

1993a). About half of the timber sold is of sufficient quality to manufacture into cants or lumber, while the remaining timber is made into pulp. In 1990, a timber volume of 38 MMBF was offered exclusively to small businesses, and 50 MMBF were made available in 1991.

Sawmills in Southeast Alaska are located primarily in the southern region of Southeast Alaska principally on Prince of Wales Island, Ketchikan, and Wrangell (Alaska Lumbermen's Association 1994). At least 50 percent of the sawlog timber on a SBA set-aside sale must be manufactured by a firm with no more than 500 employees. Currently, Southeast Alaska SBA mills average 73 percent capacity (Alaska Lumbermen's Association 1994). In 1994, a total of 39 SBA mills were operating with a total current use per year of 210.35 MMBF for all SBA mills located in Southeast Alaska. Timber processed was primarily hemlock and spruce with lesser amounts of cedar. Total employees were 456, with most mills employing 1-2 workers and only 8 mills employing more than 10 workers (Alaska Lumbermen's Association 1994).

The sawmills of Southeast Alaska have increasingly relied on the use and development of new technology. For example, the Ketchikan mill that is located adjacent to the pulp mill is computerized and automated. The company separates logs through each mill and supplies the higher value logs to the saw mill and the lower value logs to the pulp mill. The automated mills in Southeast Alaska are anticipated to employ fewer people but will keep the industry viable and competitive (Alaska Department of Labor 1991).

The larger independent mills have traditionally focused on the manufacture of cants for the overseas market. Some people believe primary processing of lumber in Southeast Alaska is increasing in demand and value due to decreasing timber production in the Pacific Northwest. The smaller SBA mills generally produce custom-cut building lumber, chips for pulping or landscape usage, cedar shakes or shingles for roofing materials, and music wood or special building novelty wood used primarily for gifts (Alaska Lumbermen's Association 1994). Recently, output has also included sawn dimension timber for both foreign and domestic markets.

Timber sale offerings for the independent sale program were 61 MMBF for 1993, which although it represents an increase of 50 percent from 1992, is approximately 15 percent below the average over the past five years (Alaska Lumbermen's Association 1994).

Timber Employment - Employment related to the timber industry in Southeast Alaska from 1989 to 1991 averaged 5,825 persons with most involved in timber harvesting and processing jobs (Table 3-25). Of the direct employment, most jobs are in logging. (USDA-FS 1993a). Logging generates 60 percent of the direct

Table 3-25

Employment in the Timber Industry[1] of Southeast Alaska, 1981-1994

Type of Job	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Logging[2]	1,047	991	1,010	946	1,004	1,239	1,545	1,981	2,113	2,144	1,554	1,415	1,344	1,177
Sawmill	605	540	429	395	363	331	375	468	478	500	604	538	447	515
Pulpmill	1,081	975	854	700	580	772	861	892	925	899	911	910	859	533
Total Direct[3]	**2,733**	**2,506**	**2,293**	**2,041**	**1,947**	**2,342**	**2,781**	**3,341**	**3,516**	**3,543**	**3,069**	**2,863**	**2,650**	**2,225**
Indirect[4]	2,125	1,950	1,800	1,600	1,500	1,825	1,950	2,350	2,550	2,570	2,226	2,077	1,935	1,624
Total	**4,858**	**4,456**	**4,093**	**3,641**	**3,447**	**4,167**	**4,740**	**5,691**	**6,066**	**6,113**	**5,295**	**4,940**	**4,585**	**3,849**

1 Figures reported here include employment related to the harvest and processing of timber from all ownerships in Southeast Alaska.

2 Jobs related to logging operations, such as road construction, are counted as indirect employment.

3 Source: Alaska Department of Labor and USDA Forest Service Region 10, Ecosystem Planning and Budgeting.

4 Two computer simulation models (IPASS and IMPLAN) were used to estimate indirect employment. The distinction between direct and indirect employment is a function of the Standard Industrial Classification (SIC) System used nationally for the collection and grouping of economic statistics. For purposes of this report, the wood products "industry" is defined as logging, sawmills, and pulp mills. Persons employed in these occupations are reported here as "direct" employment. "Indirect" employment refers to the persons employed in all businesses supporting operation of the wood products industry. For example, the owners of a sawmill may purchase goods and services (such as power or repair services) from local merchants thereby contributing to their sales volume and employment. Other indirect jobs are supported when employees of the wood products industry spend their take-home pay in local communities.

timber industry jobs, pulp mills generate 25 percent, and sawmills 15 percent. About 68 percent of the total timber industry jobs were dependent on timber from the Tongass National Forest between 1989 and 1991 (USDA-FS 1993a). Changes in employment levels have historically been attributed to the value of the dollar and timber supply in the world market. Increases in employment since 1985 are due to an increase in the export of unprocessed logs from the Native corporation harvest. Over the next few years, employment is expected to decrease up to 9 percent with the largest declines in logging due to the decreased harvests of Native-owned timber. Since a large proportion of Native-owned timber is exported before it is processed, declines in Native logging do not necessarily mean a decline in employment in sawmills and pulp mills. Demand for forest products is expected to fluctuate in future years (Alaska Department of Labor 1991).

Alaska's Commercial Fishing Industry

Considering the entire United States, Alaska has the greatest total commercial fish landings and total value of these landings. Commercial landings in 1990 were valued at $1.5 billion which is almost 42 percent of the value of landings for the entire nation (USDA-FS 1993a). Commercial fishers include both residents and

nonresidents. Employment in the commercial salmon fisheries is affected by the permitting policies of Alaska's Commercial Fisheries Entry Commission, the strength of each year's salmon runs, the escapement and subsistence harvest, and changes in market prices for fresh and processed salmon. Crew members are paid on a share system based on the value of the catch.

Several problems continue to plague the fishing industry. The maximum sustainable harvest remains unknown for many species; consequently, resource managers are conservative in harvest quotas. Processing is labor-intensive which increases costs and decreases profits. Packaging and delivering products to the Japanese has been difficult and costly (Alaska Department of Labor 1991). Seafood demand is sometimes very weak in Japan, which affects overall supply and demand. Continental U.S. demand for Alaska seafood is increasing, but increased competition from Russia and Chile is expected. Offshore processors are beginning to develop an interest in inshore fisheries (within 200 miles of the coast) which increases competition (Alaska Department of Labor 1993).

Alaska's Seafood Cannery Industry - Through the 1980s, direct seafood cannery employment was relatively stable, although annual fish harvest fluctuated considerably because employers typically work employees longer hours when harvest increases rather than hire more employees. In the 1990s, the number of cannery workers is expected to remain relatively stable from 1992 to 1997 (Alaska Department of Labor 1994a). Salmon runs are expected to be favorable, but the price is expected to be poor due to world oversupply (Alaska Department of Labor 1994b). The nearest seafood processors to the project area are four processors in Petersburg, one processor each in Juneau and Kake, and two processors in Wrangell (Table 3-26) (Cheshire 1991).

The increased activity in bottomfishing has helped increase employment. New fish products include sea urchins and sea cucumbers, which are considered delicacies in Japan. These products must be carefully harvested, prepared, and packaged, making this labor intensive work (Alaska Department of Labor 1991).

Alaska's Seafood Harvesting Industry - An estimate of seafood harvesting employment is not directly available, although it can be indirectly calculated through the number of permit holders who participate each year in the Limited Entry fisheries. For each permit, an estimate of the total number of fishers employed is determined by the average crew size for each gear type (Table 3-27). For the Juneau area, 840 permits were issued in 1994, 1,370 permits were issued for Petersburg, 907 permits were issued for Ketchikan, 1,537 were issued for Sitka, 293 permits were issued for Haines, and 629 permits were issued for Wrangell. These permits may be issued for both residents and nonresidents and are not limited to the project area.

Table 3-26

Seafood Processing Employment in Southeast Alaska

	Employment Summer	Employment Fall, Winter, Spring	Products
Juneau			
Taku Smokeries	12	7	salmon, black cod, halibut
Petersburg			
Alaska Glacier Seafoods	100	25	salmon, crab, shrimp, rockfish, black cod, flounder, halibut
Chatham Strait Seafood	260	2	salmon, herring, crab, bottomfish, halibut
Icicle	550-600	38	salmon, herring, crab, shrimp, bottomfish, halibut
Nelbro Packing	150	0	salmon
Wrangell			
Sea Level Seafoods	1	0	salmon, crab, shrimp, other shellfish
Wrangell Fisheries	120	30	salmon, herring, halibut, black cod
Kake			
Ocean Fresh Seafoods[1]	50	N/A	salmon sausage, salmon ham

[1] Most information is not available for this seafood harvesting company

Source: Cheshire 1991, Lynch 1995 for Summer 1994 employment, Gunther 1995b

Table 3-27

Average Crew Size for Each Gear Type Used in Southeast Alaska

Gear Type	Crew Size
Salmon purse seine	5.25
Salmon drift gillnet	1.75
Salmon set gillnet	2
Salmon power troll	1.75
Salmon hand troll	1
Herring purse seine	5.5
Herring set/drift gillnet	2

Source: Thomas 1986

Considering the communities closest to the project area, 2,839 commercial fishers are projected to have gainful employment as seafood harvesters. Table 3-28 shows relative distribution by gear type and number of workers, although the total

Table 3-28
1988 Limited Entry Salmon Permits by Gear Type and Community

Community	Gear Type	1988 Number of Permits	Number of Employees Expected
Juneau			
	Seine	8	42
	Drift gillnet	73	128
	Yakutat set net	7	14
	Power troll	93	163
	Hand troll	346	346
	Total		**693**
Kake			
	Seine	9	47
	Drift gillnet	0	0
	Power troll	4	7
	Hand troll	76	76
	Total		**130**
Petersburg			
	Seine	48	252
	Drift gillnet	65	114
	Yakutat set net	1	2
	Power troll	84	147
	Hand troll	168	168
	Total		**683**
Wrangell			
	Seine	9	47
	Drift gillnet	26	45
	Power troll	47	82
	Hand troll	108	108
	Total		**282**
TOTAL (all communities)			**1,788**

Source: Cheshire 1991

number of permits is based on 1988 data (Cheshire 1991). In addition to direct employment, indirect fisheries employment increases the total number of employees and personal earnings an additional 27 percent (USDA-FS's Interactive Policy Analysis Simulation System).

In Southeast Alaska, salmon harvest accounts for 75 percent of the overall commercial fisheries catch with a yearly average of 158 million pounds harvested (Table 3-29). The limited entry program for salmon in Southeast Alaska, which sets a limit on the number of fishermen in all of the Southeast salmon fisheries, has kept the number of salmon harvesting jobs virtually constant from year to year

Table 3-29

Commercial Salmon Harvest, Southeast Alaska, 1980-1991

Fiscal Year	Million Pounds Harvested	Fiscal Year	Million Pounds Harvested[1]
1980	93	1986	214
1981	111	1987	74
1982	123	1988	90
1983	156	1989	258
1984	155	1990	164
1985	231	1991	234
		Yearly Average	**158**

[1]Commercial harvest of salmon in waters on or adjacent to the Tongass National Forest.

Source: Draft ANILCA Section 507(b) Cooperative Fisheries Planning Status Report.

regardless of the number of fish caught. However, the shellfish and finfish fisheries is continuing to grow in Southeast Alaska both in weight and total value. The rapid growth in these industries may exceed the amount that is biologically sustainable. In the past, the crab and demersal rockfish fishery have shown signs of over-harvesting. The primary advantage in the growth of the shellfish and finfish fisheries is that most harvests occur during the fall, winter, and spring, thereby offering more year-round employment for the fishing industry. Other developments that have contributed to the growth and stability of the seafood industry are value-added processing, the increase in miscellaneous shellfish (such as sea cucumbers), and the start-up of new shellfish aquaculture farms (Cheshire 1991).

Gross earnings and price/pound are available for some commercial fisheries in Southeast Alaska during 1977 to 1992. For the bait herring seine fisheries, total gross earnings have fluctuated from a low of $127,544 to a high of $1,029,862. For 1992, the year for which the most recent information is available, $630,070 is the total gross earnings which had an ex-vessel price of $0.36. Sac roe herring earnings are considerably higher. Total gross earnings for sac roe herring for 1995 are approximately $4,000,000 (Lynch 1995).

For salmon, ex-vessel prices are dependent on gear type (Table 3-30) with purse seining often receiving lowest ex-vessel prices. Coho, sockeye, and chinook salmon are typically two or more times more valuable than either chum or pink salmon. Highest prices were received in 1988 and lowest prices were received in 1993 or 1994, although 1983 also had a low ex-vessel price for coho, sockeye, and chinook salmon (ADF&G 1994a).

Table 3-30

Ex-Vessel Prices for Salmon From 1982 to 1994

Salmon	Gear Type	Price Range ($)
Chum		
	purse seine	0.27-1.03
	hand troll	0.44-2.00
	power troll	0.44-2.02
Pink		
	purse seine	0.17-0.84
	hand troll	0.25-0.97
	power troll	0.25-0.97
Coho		
	purse seine	0.37-1.97
	hand troll	0.84-3.10
	power troll	0.83-3.10
Sockeye		
	purse seine	0.83-2.92
	hand troll	0.94-3.58
	power troll	0.94-3.88
Chinook		
	purse seine	0.83-2.38
	hand troll	1.70-3.55
	power troll	1.70-3.55

Source: ADF&G 1994a and Gunther 1995b.

In 1988, salmon accounted for the highest total catch value, followed by other finfish, which accounted for 34 percent of salmon wholesale prices. Shellfish accounted for 14 percent of salmon wholesale prices (Table 3-31).

The purse seine fishery harvests 70 to 90 percent of the salmon caught in all Southeast Alaska, and pink salmon is the primary species targeted by the seine fleet. Sockeye and coho salmon account for approximately 2 percent, chum salmon 7 percent, and chinook salmon are less than 1 percent of the remaining catch (ADF&G 1994a).

Table 3-31

Wholesale Prices by Fish Group, Area, and Value for 1988 (Most Recent Year Available)

Resource			Value ($)
Salmon			
	Juneau/Yakutat		19,650
	Petersburg/Wrangell		61,001
		Total	**80,651**
Other Finfish			
	Juneau/Yakutat		9,111
	Petersburg/Wrangell		18,115
		Total	**27,226**
Shellfish			
	Juneau/Yakutat		1,769
	Petersburg/Wrangell		9,339
		Total	**11,108**
TOTAL (all resources)			**$118,985**

Source: Cheshire 1991.

Seafood Harvesting Near and Within the Project Area - In the Port Houghton/Cape Fanshaw project area, several species of marine fish are available for commercial fisheries. These species include salmon (pink, chum, coho, sockeye, and chinook), other finfish (Pacific herring, halibut, sablefish (*Anoplopoma fimbria*), flounder (*Platichthys stellatus*), sole), shellfish (coon stripe shrimp, spot shrimp, snail, crab [dungeness, tanner, king], scallop), and miscellaneous species (sea urchin, and sea cucumber) (McKenzie 1995a; Good 1995a).

Two types of salmon fisheries are common in the Port Houghton/Cape Fanshaw project area: trolling and purse seining. Trolling data (except for a recently created experimental fishery in late May and June targeting hatchery king salmon) is reported by district; thus, there are no subdistrict catch reports for 110-34 and very limited catch reports for 110-31 (the subdistricts that include the project area). Seining is reported by subdistrict, so that catches in subdistrict 110-31 include catches north to Point League (ADF&G 1994a).

Results of salmon purse-seining in Port Houghton have been tabulated since 1960 (ADF&G 1994a). Pink salmon is the primary species caught, and chinook

represents the salmon species with the fewest individuals caught. Sockeye salmon are also a relatively uncommon catch. Over the past 30 years, less than 1,000 sockeye are harvested annually. Coho harvests are similar to sockeye, except that in 1968 more than 10,000 coho were harvested. Chum salmon are harvested more often than chinook, sockeye, and coho but much less than pink salmon.

Total salmon harvested by purse seining in Port Houghton ranged from 7,130 in 1962 to 708,460 in 1992. Over the past three years, the catch has also included a total of 25,365 fish in 1993 and 637,527 fish in 1994. Opening dates have varied widely over the years depending on the number of fish projected available for harvest. Other information is available for hand trolling, power trolling, and purse seining either immediately outside the project area or including a larger area than the project area (ADF&G 1994a).

Considering only the ex-vessel price of pink salmon for 1994 at $0.21 per pound multiplied by the total catch of 637,527 by 3.75 (average number of lbs per fish), then the total value of pink salmon in Port Houghton is approximately $500,000. Note that the number of pink salmon captured does not include Frederick Sound, Fanshaw Bay, and Farragut Bay which also are adjacent to the project area.

Commercial harvests for shrimp and crab are also available. Information obtained surrounds the project area and a large area of Frederick Sound near Port Houghton (Table 3-32). Most of the crab catch is dungeness crab with smaller amounts of tanner and king crab. About half as many shrimp are caught as compared to dungeness crab (ADF&G 1994a). Shrimpers, and dungeness and king crabbers, use the marine waters adjacent to the project area from Storm Island to Point Roberts (letter dated October 16, 1994 from Gerry Merrigan). In addition, crabbers use Fanshaw Bay, an area north of Whitney Island to Roberts Islands, Sandborn Canal, and North Arm. In recent years, commercial fishing has extended into Salt Chuck (letter dated October 20, 1994 from LaVern Beier).

Herring catch for Port Houghton and Hobart Bay show that minimal harvesting occurred in 1993 and 1994; the area was not open from 1969 to 1991. The initial opening in 1992 for the Port Houghton/Hobart Bay area occurred in January (ADF&G 1994a). The ex-vessel price of herring per pound fluctuated from $0.68 to $0.140 between 1977 and 1992. An ex-vessel price of $0.13 per pound was anticipated for 1994.

Information on other finfish and uncommon species is not available. However, comment received from the public during public comment for this EIS indicates that some halibut fishing occurs at the Rusty River in the Salt Chuck, near the Lighthouse Reserve, throughout Port Houghton, and near the entrance to Sandborn Canal. Additional information from the public (letter dated October 16, 1994 from Gerry Merrigan) indicates that herring seiners, halibut, and Pacific cod longliners use marine waters adjacent to the project area.

Table 3-32

Commercial Harvest (in lbs) by Species Group From Waters at Point Vandeput to Point Hobart for Past 20 Seasons

				Average		
Species	Number Seasons	High Range	Low Range	20 Years	Last 10 Years	Last 5 Years
Shrimp	15	229,208	12,202	68,584	94,701	158,498
King Crab	20	315,546	11,014	151,356	111,201	19,973
Tanner Crab	19	148,248	5,034	58,780	41,933	44,619
Dungeness Crab	20	133,601	19,907	133,601	226,587	301,293

Notes:
1. The red and blue king crab fishery in this area was closed from 1985/86 through 1992/93 seasons.
2. All species exhibit variable annual survival and recruitment which affect harvests.
3. Other fishing opportunities and ex-vessel price variations also affect harvests.
4. King, tanner, and some shrimp fisheries are managed with harvest rate strategies. In these cases harvests are not representative of total stock abundance.

Source: ADF&G IFDB, February 15, 1995 and Gunther 1995b

Seafood Harvesting for Subsistence - Fish and game harvest for subsistence use ranges from 52 pounds annually per individual to more than 400 pounds annually per individual in Alaska. Fish and marine invertebrates account for a major proportion of this harvest, and are more than half the annual American diet of protein representing a significant portion of the diet. Subsistence fish resources primarily consist of halibut (total of 565,000 pounds harvested in Southeast Alaska), dungeness crab (total of 235,000 pounds harvested in Southeast Alaska), and salmon (total of 131,000 pounds harvested in Southeast Alaska). For all but king crab (representing 9.8 percent of the entire commercial and subsistence catch) and salmon (representing 12.7 percent of the entire catch), subsistence harvest is less than 5.2 percent of commercial harvest. The total value of all fish and game harvested for home use in Southeast Alaska is between $9 - $22.5 million for 1987 (Cheshire 1991).

Recreation and Tourism Industry in Southeast Alaska

The Southeast Alaska tourist attractions are the natural resource and topographic features that occur in undisturbed areas, which is primarily in the Tongass National Forest. These features include wildlife, fisheries, mountains, and water. Cultural manmade attractions include totem poles, tribal homes, art work, museums, hatcheries, railroads, and mines. Most tourists arrive in Alaska from June to August, although they may arrive as early as May and depart as late as September. Most tourists use package tours unlike tourists in the continental United States (Cheshire 1991).

Most tourists (60 percent) enter and depart Southeast Alaska on cruise ships. Consequently, most of the tourist facilities in Southeast Alaska are in communities

that lie along the cruise ship route—primarily Ketchikan, Juneau, Haines, and Skagway. However, more cruise ships are beginning travel to lesser known tourist destinations. Other less frequent means of travel include highway, air, and marine highway. The marine-island character of Southeast Alaska strongly influences recreational opportunities and limits locations traveled. Most recreational facilities are adjacent to or within communities (USDA-FS 1993a).

The average length of stay for tourists in Southeast Alaska is 3.7 nights for package tours and 5.3 nights for independent visitors. Visitors arriving on cruise ships have the shortest length of stay. Most dollars expended by tourists are for entertainment, recreation, and gifts, with lesser amounts expended on food, transportation, clothing, lodging, and personal goods (Cheshire 1991).

Visitation to Southeast Alaska has increased annually. Cruise traffic has grown the fastest, but ferry traffic has also increased (USDA-FS 1993a). In 1980 cruise ship traffic brought 86,815 tourists; by 1991 the number of tourists on cruise ships had increased to 248,428. In 1993, the region had slightly over 300,000 cruise ship visitors, but expected at least 350,000 cruise ship visitors in 1994 and 400,000 visitors in 1995. Alaska's future growth in tourism is anticipated to increase in the number and size of cruise ships. More and larger ships are expected to replace smaller ones and more cruise companies are expected to enter the Alaska market.

Ferry traffic is also expected to increase. One ferry will continue to travel between Bellingham, Washington and Skagway, and three ferries will travel from Prince Rupert, British Columbia, to Skagway. The increase of one ferry from Prince Rupert will decrease turnaround time and increase capacity. These ferry routes provide stops in Ketchikan, Wrangell, Petersburg, Sitka, Juneau, and Haines. Reduced service occurs in the winter months when maintenance occurs. The feeder routes on the marine highway system service smaller communities, thereby allowing residents and tourists travel between these communities and larger communities. The ferry traffic has grown in Southeast Alaska from 22,150 passengers in 1978 to 342,613 passengers in 1993 with most traffic occurring from May to September. A traffic decrease in 1993 was attributed to airfare competition between MarkAir and Alaska Airlines, as well as a vessel not returning to service on schedule (Alaska Marine Highway System 1994). While travelers on cruise ships are all tourists, use of ferries additionally includes residents and commercial needs.

Cruise ships and ferry traffic that travel near the project area use the Stephens Passage route; this does not include Port Houghton or shallower waterways. The route is used when the ships are traveling between Juneau and Petersburg or other southern communities.

The economic impact of tourism in Southeast Alaska has been evaluated through a comprehensive survey of visitors to Southeast Alaska in 1988 (Southeast Alaska

Pleasure Visitor Research Program 1988). Results of this study indicated that the overall experience of travelers was rated very highly, 70 percent of all tourists to the State of Alaska visited Southeast Alaska, and independent travelers tended to make more direct use of the National Forest than visitors on package tours.

The tourism industry cannot be defined as a specific set of jobs and can only be approximated by indirect means. The USDA-FS IPASS system has estimated that personal earnings directly and indirectly related to tourist expenditures for lodging, travel, guided fishing and hunting have increased from $53.6 million in 1980 to $93.9 million in 1989 (Cheshire 1991). Although the direct earnings for each sector were not identified, it is known that resident and non-resident sport anglers went fishing for a total of about 126,000 days in 1993 in Southeast Alaska. Total expenditures by anglers supported about 950 full-time jobs with earnings of about 22.5 million dollars (USDA-FS 1993a). The Southeast Alaska sport fishing tourism market in 1994 had the opportunity to take advantage of the recent sport fishing restrictions in Washington, Oregon, British Columbia (Vancouver Island), and Kenai River area. Thus, sport fishing and associated tourism in Southeast Alaska have increased significantly over the past two years.

During fall 1994, Parametrix, Inc. conducted a recreational survey to determine use of the project area by tourists. A questionnaire was sent to 69 individuals and groups, including all outfitters and guides having special use permits in the project area. It was also sent to individuals and groups on a Forest Service mailing list that have indicated an interest in recreational issues in the Tongass National Forest. Most use of the area was by small boat, although some helicopter and float plane flights occur throughout the year. The number of tourists per boat operator that selected the Port Houghton/Cape Fanshaw project area ranges from one to 101, depending on vessel size. The larger vessels generally do not travel inside Port Houghton.

Tourists are attracted to the area primarily for the natural scenery, nature exploring, photography, viewing and hunting wildlife, and fishing. The unique attractions of the project area to tourists are the humpback whales and the large number of bear present. Other wildlife and fish are of interest, although similar or better opportunities may exist closer to the originating community. However, one important attraction of the project area is that it is very remote with minimal use; therefore, it attracts the tourist in search of privacy. Some local outfitters do not frequent the project area because they believe that their tourists do not want to view the logging currently ongoing on the adjacent Hobart Bay lands owned by Goldbelt, Inc. The cost and charges by each outfitter using the project area vary substantially with the highest costs for inclusion of a hunting guide and the type of recreational equipment and transport provided. The prices quoted by operators ranged from $150/day to $1,000/day. Response was not specific enough and too limited to calculate an average cost.

In considering tourism throughout Southeast Alaska, the project area is not significant economically, because use is limited in comparison to other higher use areas. The area is important in providing natural scenery of unaltered old-growth forests to passengers on cruise ships and ferries. Small numbers of outfitters (mostly from the Petersburg area) transport tourists to the project area, especially those interested in remote isolated areas, humpback whales, and bear hunting opportunities. These operators are dependent on Port Houghton for providing these unique opportunities, although recognizing that the area is also used for commercial fishing and that clearcuts occur on Goldbelt, Inc. lands. Use of the project area is limited due to the distance of the area to communities. Independent travelers who expend more dollars and time in Southeast Alaska are those who primarily use the project area compared to the cruise ship visitors and individuals on package tours planned in the continental U.S.

Chapter 4

Environmental Consequences

Chapter 4

Environmental Consequences

This chapter describes the physical, biological, economic, and social effects likely to result from implementing each of the alternatives. A summary of the consequences of each alternative is displayed in tables within Chapter 2. This information has been taken from more detailed reports that are available for public review in the planning record. The impacts of the proposed modifications are addressed for each issue.

Timber (Issues 1 and 2)

Timber sale activities would directly affect vegetation in the areas harvested. The short-term and most obvious effect would be the conversion of old-growth forest stands into young, early successional timber stands. The following discussion of direct and indirect environmental effects on vegetation is developed from concerns and issues expressed by the public and interdisciplinary team for the Port Houghton/Cape Fanshaw EIS.

Direct Effects

The number of harvest units proposed, the number of acres within units, and the average unit size are summarized by VCU and alternative in Table 4-1. Suitable forest land includes only those lands that can be regenerated successfully, logged without causing irreversible soil damage, and are not withdrawn from timber production by regulations or administrative action. Historic harvest in the project area is essentially non-existent, occurring in various small patches, totaling less than 200 acres between 1948 and 1952.

Harvest Unit Openings Exceeding 100 Acres in Size

National Forest Management Act (NFMA) regulations provide that 100 acres is the maximum size of created openings allowed for the western hemlock-Sitka spruce forest type of coastal Alaska, unless excepted under certain conditions (USDA-FS 1983b). For the Port Houghton/Cape Fanshaw harvest, six units are proposed where openings in the forest canopy would exceed 100 acres in size. Under NFMA, the opening size may be extended to 150 acres under certain conditions, and 200 acres under extreme circumstances (major insect and disease outbreak, fire, windthrow, or other form of catastrophic damage). Justifications for exceeding the 100-acre size limitation are provided in Appendix D. Table 4-2 identifies the proposed harvest units exceeding 100 acres, shown by alternative.

Table 4-1.

Effect of Harvest in the Port Houghton/Cape Fanshaw Project Area by Suitable Forest Land (67,831 acres), Commercial Forest Land (85,693 acres), and Total Land Area Available for Forest Service Management (136,317 acres[1]).

VCU	Proposed Harvest Acres[2]	Suitable Forest Land(%)	Commercial Forest Land(%)	Total Land Area Harvest(%)	Proposed Harvest Acres[2]	Suitable Forest Land(%)	Commercial Forest Land(%)	Total Land Area Harvest(%)
	Alternative B				Alternative C			
Chatham Area (62%)					Chatham Area (71%)			
79	242	1.3	1.0	0.6	632	3.4	2.6	1.5
80	258	10.2	7.6	4.3	476	18.8	14.0	8.0
81	-	0.0	0.0	0.0	287	20.3	15.8	11.5
82	1,617	20.8	17.2	14.1	1,760	22.6	18.8	15.4
83	1,518	24.5	19.8	14.1	679	11.0	8.8	6.3
84	96	1.5	1.0	0.6	172	2.7	1.8	1.0
Subtotal	**3,731**	**8.8**	**6.7**	**4.2**	**4,006**	**9.4**	**7.1**	**4.5**
Stikine Area (38%)					Stikine Area (29%)			
85	-	0.0	0.0	0.0	-	0.0	0.0	0.0
86	144	3.6	3.2	1.7	144	3.6	3.2	1.7
87	411	5.5	4.6	2.9	411	5.5	4.6	2.9
88	-	0.0	0.0	0.0	-	0.0	0.0	0.0
89	1,751	18.9	16.2	10.4	1,057	11.4	9.8	6.3
Subtotals	**2,306**	**9.1**	**7.8**	**4.9**	**1,612**	**6.4**	**5.4**	**3.4**
Totals	**6,037**	**8.9**	**7.0**	**4.4**	**5,618**	**8.3**	**6.6**	**4.1**
	Alternative D				Alternative E			
Chatham Area (67%)					Chatham Area (70%)			
79	540	2.9	2.2	1.3	-	0.0	0.0	0.0
80	336	13.2	9.9	5.6	-	0.0	0.0	0.0
81	309	21.8	17.0	12.4	-	0.0	0.0	0.0
82	1,847	23.7	19.7	16.2	915	11.8	9.8	8.0
83	1,687	27.2	22.0	15.6	1,904	30.7	24.8	17.6
84	142	2.3	1.4	0.8	989	15.7	10.1	5.7
Subtotal	**4,861**	**11.4**	**8.7**	**5.5**	**3,808**	**8.9**	**6.8**	**4.3**
Stikine Area (33%)					Stikine Area (30%)			
85	-	0.0	0.0	0.0	-	0.0	0.0	0.0
86	70	1.7	1.5	0.8	144	3.6	3.2	1.7
87	500	6.7	5.7	3.5	465	6.3	5.3	3.2
88	-	0.0	0.0	0.0	-	0.0	0.0	0.0
89	1,813	19.6	16.8	10.7	1,054	11.4	9.8	6.2
Subtotals	**2,383**	**9.4**	**8.1**	**5.0**	**1,663**	**6.6**	**5.6**	**3.5**
Totals	**7,244**	**10.7**	**8.5**	**5.3**	**5,471**	**8.1**	**6.4**	**4.0**

[1]Excluding the Cape Fanshaw Natural Area.
[2]Harvest acres include timbered road right-of-way acres.
Source: Jenkins 1995b

Table 4-2.
Harvest Unit Openings Exceeding 100 Acres In Size

Harvest Unit	Unit Acres	Acres			
		Alt. B	Alt. C	Alt. D	Alt. E
27107 (160)	120	120	120	120	120
29126 (145)	158	-	158	-	158
29127 (166)	168	-	168	-	168
331045 (62)	126	126	-	126	126
341107 (139)	128	-	-	-	128
341109 (149)	105	-	-	-	105
Totals:	**805**	**246**	**446**	**246**	**805**

Source: Jenkins 1995b

Alternatives B and D have the fewest number of units which would create openings over 100 acres. However, these alternatives operate over the largest total acres, with the highest percentages of partial harvest. Alternative E contains all six harvest units that would exceed 100-acre openings. It operates over the fewest total acres with the highest percentage of clearcut harvest, as shown in Table 4-3.

Proposed Harvest by Silvicultural Method

The total acres by volume class and alternative for each prescribed silvicultural method are listed in Table 4-3. Alternative B contains a 679-acre helicopter salvage area that retains approximately 50 percent of the current standing net scribner volume. Alternative D has both the helicopter salvage area (679 acres) and six group selection areas (1,133 acres), where 50 percent and 25 percent of the standing scribner volume would be recovered in this entry, respectively. Alternative C has no helicopter yarding, and has a slightly higher proportion of clearcutting than Alternatives B and D. Alternative E also has no helicopter yarding, and has the highest proportion of prescribed clearcutting, with the lowest total acres over which harvest operations would occur.

Site Productivity and Species Composition

Site index is a measure of the relative productivity of a particular forest site. Knowledge of the productivity is important in predicting future timber yields and to assist in establishing silvicultural priorities.

Site-specific measures of productivity were made using the identification of plant associations and calculation of the site index using base 50 site index curves (Farr 1984). Site productivity is closely tied to the volume class strata in the GIS TIMTYP layer. Field plot classifications of plant association were summarized

Table 4-3

Silvicultural Method Acres by Volume Class and Alternative for Harvest Units*

Silvicultural Method	3	4	5	6	7	Vol Acres	Non-Forest	Low Prod.	Total Acres	Total %
	Volume Class Acres									
Alternative B										
Clearcut & w/Reserves	4	864	1,203	1,323	13	3,407	5	30	3,442	59
Shelterwood w/Reserves	-	410	570	487	2	1,469	2	5	1,477	26
Group Selection	-	51	37	78	-	166	-	-	166	3
Sanitation Salvage	-	399	251	21	7	678	-	1	679	12
Overstory Removal	-	-	-	19	-	19	-	-	19	0
Out areas within Units**	-	-	-	-	-	-	-	2	2	0
TOTALS:	**4**	**1,724**	**2,061**	**1,929**	**22**	**5,740**	**7**	**38**	**5,785**	**100**
	0%	30%	36%	34%	0%	100%				
Alternative C										
Clearcut & w/Reserves	4	1,087	1,244	1,234	1	3,569	12	33	3,614	68
Shelterwood w/Reserves	-	542	701	409	2	1,654	-	8	1,662	32
Out areas within Units	-	-	-	-	-	-	4	5	8	0
TOTALS:	**4**	**1,629**	**1,945**	**1,643**	**3**	**5,223**	**16**	**45**	**5,284**	**100**
	0%	31%	37%	32%	0%	100%				
Alternative D										
Clearcut & w/Reserves	4	1,107	1,207	1,260	12	3,590	5	26	3,621	52
Shelterwood w/Reserves	-	637	486	325	5	1,453	-	12	1,465	21
Group Selection	-	447	174	379	-	1,000	-	35	1,035	15
Sanitation Salvage	-	399	251	21	7	678	-	1	679	10
Overstory Removal	-	19	2	159	-	180	-	-	180	3
Out areas within Units	-	-	-	-	-	-	-	2	2	0
TOTALS:	**4**	**2,609**	**2,120**	**2,144**	**24**	**6,901**	**5**	**76**	**6,982**	**100**
	0%	38%	31%	31%	0%	100%				
Alternative E										
Clearcut & w/Reserves	4	1,481	1,824	1,442	51	4,802	7	25	4,834	93
Shelterwood w/Reserves	-	61	120	165	12	358	-	-	358	7
Out areas within Units	-	-	-	-	-	-	4	7	11	0
TOTALS:	**4**	**1,542**	**1,944**	**1,607**	**63**	**5,160**	**10**	**32**	**5,203**	**100**
	0%	30%	38%	31%	1%	100%				

* Does not include road right-of-way acreage.

** Out areas within units are nonforest or low site areas which were flagged out as exclusions within the greater unit boundary.

Source: Jenkins 1995b.

with site index measurements taken on the plots. These data were correlated to volume class and VCU in the Timber Resource Inventory Report, and summarized by species and alternative below in Table 4-4. Alternative D has the highest proportion of volume class 4 proposed for harvest (at 38 percent; refer to Table 4-3). This has the effect of lowering the average productivity for Alternative D by one foot of site index (one foot less height growth in 50 years), when compared to the other alternatives.

Table 4-4
Average Site Index and Percent Composition by Species and Alternative

Species	Average Site Index	% Species	Species	Average Site Index	% Species
Alternative B			**Alternative C**		
Western Hemlock	56	64	Western Hemlock	55	63
Sitka Spruce	63	17	Sitka Spruce	62	16
Alaska Yellow-Cedar	44	14	Alaska Yellow-Cedar	44	13
Mountain Hemlock	42	5	Mountain Hemlock	43	8
Total Average	51	100	Total Average	51	100
Alternative D			**Alternative E**		
Western Hemlock	55	63	Western Hemlock	56	66
Sitka Spruce	62	16	Sitka Spruce	64	16
Alaska Yellow-Cedar	43	14	Alaska Yellow-Cedar	44	15
Mountain Hemlock	42	7	Mountain Hemlock	42	3
Total Average	50	100	Total Average	51	100

Source: Jenkins 1995b

Proportionality by Alternative

The Tongass Timber Reform Act of 1990 (TTRA) requires that volume classes 6 and 7 be harvested in proportion to other volume classes as they existed within a Management Area prior to passage of the act (November 28, 1990), a practice referred to as proportionality. Although this requirement applies only to the long-term timber sale contract and only on a management area basis, this issue was raised during the public scoping process.

This issue revolves around whether or not the higher volume timber stands are being logged first without regard to future entries. Removing timber from the high volume stands could result in a disproportionate amount of area in low volume stands.

Table 4-5 shows the proportion of acres for harvest in volume classes 6 and 7. The proportion of volume class strata 6 and 7 remaining after harvest would decrease slightly under all alternatives. At -0.57 and -0.55 percent (Management Area S01 and C14, respectively) change in proportion of volume classes 6 and 7,

Table 4-5

Area and Proportion of Volume Classes 6 and 7 Harvested[1] for Each Alternative by Management Area.

Management Area	Suitable Timber Acres Total	Volc 6 & 7	Proportion
Stikine Area (S01)	25,247	3,263	12.92%
Chatham Area (C14)	42,489	15,773	37.12%
Total Project[2]	67,736	19,036	28.10%

Management Area	Harvest Acres	Unharvested Acres	Area of Volume Class 6 & 7 Harvest Acres	Area of Volume Class 6 & 7 Unharvested Acres	Proportion of Unharvested Area in Vol. Classes 6 & 7(%)	Change in Proportion of Vol. Classes 6 & 7(%)
Alternative B						
Stikine Area (S01)	2,212	23,035	419	2,844	12.35	-0.58
Chatham Area (C14)	3,523	38,966	1,532	14,241	36.55	-0.57
Total Project[2]	5,736	62,000	1,951	17,085	27.56	-0.55
Alternative C						
Stikine Area (S01)	1,531	23,716	237	3,026	12.76	-0.16
Chatham Area (C14)	3,688	38,801	1,409	14,364	37.02	-0.10
Total Project[2]	5,219	62,517	1,646	17,390	27.82	-0.29
Alternative D						
Stikine Area (S01)	2,285	22,962	413	2,850	12.41	-0.51
Chatham Area (C14)	4,612	37,877	1,753	14,020	37.01	-0.11
Total Project[2]	6,897	60,839	2,166	16,870	27.73	-0.37
Alternative E						
Stikine Area (S01)	1,572	23,675	239	3,024	12.77	-0.15
Chatham Area (C14)	3,584	38,905	1,431	14,342	36.86	-0.26
Total Project[2]	5,156	62,580	1,670	17,366	27.75	-0.35

[1] Harvest acres do not include non-forest, low productivity or volume class 3 acres.
[2] Project area totals are shown for information only. Proportionality only applies to management areas.
Source: Jenkins 1995b

Alternative B exceeds the Forest Service Handbook guideline of -0.50 percent within a given Management Area for long-term timber sale contracts (see page 7 of Region 10 Supplement 2409.18-93-3 to the Sale Preparation Handbook.

On April 14, 1994, the Alaska Pulp Corporation (APC) contract was terminated. The TTRA proportionality requirement will apply to any KPC long-term contract offerings used to implement this project. Alternatives which leave the highest proportion of volume classes 6 and 7 remaining provide the most flexibility if

future harvest in the area is included in a long-term contract. Alternatives C and D would leave the highest proportion remaining in the higher volume classes, and Alternative B the least; however, these differences are not significant.

Indirect Effects

Plant Succession

The type of vegetation that succeeds timber harvesting is a concern to resource scientists and foresters. Regenerated stands created by timber harvesting would result in species and size class changes. There would also be wildlife and biodiversity effects, which are discussed in others sections of this chapter.

The Port Houghton/Cape Fanshaw area is composed of overmature stands, which form a mosaic of patches of shrubs, tree saplings, and herbs alternating with patches of overmature timber. The physical structure of the old-growth understory and overstory is considered the most diverse of all stages of plant succession (Alaback 1982). Each stand renews itself through small windthrow events, creating small openings in which new trees and shrubs regenerate. The major timber species consist of western hemlock (*Tsuga heterophylla*), Sitka spruce (*Picea sitchensis*), Alaska yellow cedar (*Chamaecyparis nootkatensis*), and mountain hemlock (*Tsuga mertensiana*). Under Alternative A, the project area would continue in this self-perpetuating stage. This would also apply to those areas not harvested under any alternative. Currently the Port Houghton/Cape Fanshaw project area has 67,458 acres (99.59%) of the suitable commercial forest land (67,735 acres) in this old-growth stage.

Timber harvest activities would primarily affect forested plant communities, with the exception of road construction and log storage/transfer facilities in non-forest areas. The most obvious effects from harvest on vegetation in the project area would be the conversion of old-growth forest stands into young, early successional timber stands. Second-growth stands would show less variability in tree diameter and height than the mature and overmature stands they would replace.

During the first five years following harvest, there would be a rapid establishment of tree species, shrubs, forbs, and grasses. Increased temperature and sunlight would stimulate the breakdown of organic material, increasing nutrient availability and vegetation growth. Species such as Alaska blueberry and red huckleberry would increase in productivity due to vigorous sprouting from underground stems (Alaback 1984). Other species of blueberry and huckleberry, salmonberry, and western hemlock would also respond positively to the removal of the tree canopy. Mosses, lichens, herbs, and shrubs that thrive best in the shade and protection of a mature overstory would be reduced in vigor and competitive ability. Because of the overstory removal, stands adjacent to the new openings would be more susceptible to windthrow. Understory development along the edge of adjacent timber stands would increase due to additional sunlight (edge effect).

Partially harvested areas would produce a different response in vegetation than clearcutting. Since Sitka spruce is the least shade-tolerant of the major timber species, Sitka spruce would likely comprise a smaller proportion of the regenerated stand when compared to those areas that would be clearcut (yellow-cedar is similar in shade tolerance to Sitka spruce). Western hemlock has a higher shade tolerance and would be more likely to survive under the shade of an overhead canopy. The amount of ground disturbance would influence the species composition following harvest. A clearcut harvest would likely cause the most ground disturbance of the various silvicultural systems. The mineral seedbed produced under these conditions favors Sitka spruce, as well as non-commercial species such as salmonberry and alder. Western hemlock has a greater ability than other tree species to develop seedlings on logs and other organic material, which allows this species to dominate in areas with little ground disturbance.

Stands proposed for clearcut harvest in all action alternatives are expected to regenerate naturally. The National Forest Management Act requires that stands be adequately regenerated within five years of harvesting. Hand planting of nursery grown seedlings would be prescribed for stands which cannot be certified as adequately stocked, or where species diversity and enhancement is desired.

Between years 5 and 20, Sitka spruce, western hemlock, and Alaska yellow cedar seedlings would grow into a young forest with an estimated 3,000 stems per acre (USDA-FS 1991). Understory production of woody-stemmed species is at its highest rate at this stage, especially in *Vaccinium*-dominated sites. Larger dead materials from the original stand would begin to decompose, and the stand edge stabilizes, resulting in less windthrow. These stands would now be considered for precommercial thinning (at approximately 20 years of age).

Between the ages of 20 and 80 years, trees would grow rapidly, averaging about one foot in height per year (Zaborski and Buyarski 1991). Tree crowns would close to form a dense canopy, which would result in a rapid reduction in understory biomass and an increase in dense moss. Stands could develop a two-layered canopy, with western hemlock in the lower tier. Canopy closure would occur more slowly in precommercially thinned sites. At age 80, growth would begin to slow as competition between trees increases.

In years 80 to 100, the stand would become mature. At age 100, tree heights would range from 75 to 130 feet and diameters range from 10 to 15 inches, depending on site productivity. Some trees would die, while others would become dominant in size. Wood decay and defect would become a more significant component of the standing timber volume. Moss would continue to dominate the understory, except in cases where the canopy has been opened to allow sufficient sunlight for herbaceous plants. This would be the normal rotation age, when a regenerated stand would be considered for harvest. For those stands to be managed for longer rotations, the above structural characteristics would continue

into the later stages of the stand (120 to 140 years) with continued slow growth and occasional openings in the canopy from windthrow.

Forest Productivity and Health

The effect of harvest on productivity and forest health is a concern to foresters. Each action alternative would result in the conversion of unmanaged overmature stands, with a net growth near zero, to managed, more productive second growth stands with a significantly higher net growth. Overmature stands have lower forest floor temperatures than even-aged stands. As a result, organic matter decomposition is slower, which decreases the supply of available nutrients. Even-aged stands maintain growth at a higher level than mature and overmature stands (Harris and Farr 1974). Generally, volume yield will increase 150 percent on managed stands over the rotation.

Timber stands proposed for harvest in all action alternatives are beyond the age of maximum average annual growth of the stand. Overmature stands within the project area are at an equilibrium, where net growth of the younger trees is balanced by growth loss from the mortality of mature trees. These conditions would remain under Alternative A, and in the unharvested old-growth timber stands of the action alternatives.

The open conditions created in clearcuts allow both Sitka spruce and western hemlock to regenerate rapidly. Depending on the soil type, amount of soil disturbance at regeneration, and age, even-aged stands usually contain from 10 to 75 percent spruce. Selective precommercial thinning would increase the proportion of spruce if western hemlock trees were thinned proportionally more than spruce. On average, the volume of spruce in even-aged stands 75 to 100 years after harvest is about 50 percent (Taylor 1934) compared to 28 percent in existing mature and over mature stands.

Precommercial thinning of harvest stands would increase the amount of usable fiber, as growth would be concentrated on fewer stems. Merchantable sized logs would be produced in a shorter period of time, allowing the possibility of reducing the rotation age. Preliminary information (Alaback 1984) suggests that thinnings may enhance understory productivity in young (pre-canopy closure) stands, but there is no evidence to date that subsequent thinnings would increase the diversity of understory vegetation found in old growth forests. Table 4-6 shows the total potential amount of planting and precommercial thinning by alternative.

Alternative E has the highest relative potential acres for planting at 23 percent of the total acres for the alternative. Alternative E has the highest proportion of clearcut harvest. Alternatives B, C, and D have a potential for planting on 19 percent of their respective alternative acres. Most of the planting is recommended for species diversity and enhancement. The amount of potential precommercial

Table 4-6

Alternative Comparisons of Indirect Effects: Potential Planting and Precommercial Thinning Acres and Units

Harvest	Total Unit Pool	%	Alt. B Totals	Alt. B %	Alt. C Totals	Alt. C %	Alt. D Total	Alt. D %	Alt. E Total	Alt. E %
Alternative Totals										
Acres:	10,674	100	6,038	100	5,620	100	7,243	100	5,472	100
# Units:	181	100	97	100	97	100	120	100	98	100
Potential Planting										
Acres:	1,648	15	1,161	19	1,073	19	1,340	19	1,246	23
# Units:	50	28	33	34	30	31	37	31	39	40
Potential Precommercial Thinning										
Acres:	5,171	48	3,024	50	3,203	57	2,877	40	3,142	57
# Units:	146	81	87	90	91	94	88	73	87	89

* Harvest acres include road right-of-way acres.
Source: Jenkins 1995b

thinning is lowest in Alternative D, which has the highest proportion of partial harvest.

Younger stands created as a result of harvesting would be relatively disease-free when compared to the overmature stands. Wood decay and defect would be less than in old-growth timber stands. Although dwarf mistletoe would not be eliminated through timber harvesting, the effect of this pathogen on tree growth is not expected to be critical to growth in young second-growth stands, as silvicultural treatment of mistletoed stands is a priority.

Alaska yellow cedar decline is associated with poorly drained, boggy conditions (USDA-FS 1985a). Widespread succession from forest to bog vegetation may be partly caused by podzol formation, nutrient immobilization, and lack of soil disturbance (Bormann and Sidle 1990). It is suggested that deep mixing of the soil could set back this succession and restore soil productivity. The uprooting of trees can be similar to subsoil plowing (Harris 1989). Soil disturbance is reduced when trees are harvested before they can be windthrown (Bormann and Sidle 1990). Clearcutting would reduce the occurrence of windthrow within harvest units, while potentially increasing windthrow along their perimeters. Retaining reserve trees would provide opportunity for windthrow, maintaining soil disturbance patterns within harvest units throughout the rotation. The process of decline may advance within clearcuts without reserve trees, while conversely, its progress may be set back by windthrow of retained trees.

Total yield per acre is expected to be higher in second-growth stands than in mature and overmature stands. In comparison to overmature stands, log quality would be lower, due to the higher proportion of volume in small diameter trees, and a smaller proportion of knot-free wood. Concurrently, there would be less wood decay in the second-growth stand.

Another significant indirect effect of harvest is the increased potential for windthrow of trees from bordering stands and residual trees within units. Table 4-7 shows the high windthrow risk unit acres for each action alternative.

Table 4-7
Windthrow Risk Area by Alternative

			Alternative Totals							
			Alt. B		Alt. C		Alt. D		Alt. E	
Harvest	Total[1] Unit Pool	%	Totals	%	Totals	%	Total	%	Total	%
Acres[2]:	10,674	100	6,038	100	5,620	100	7,243	100	5,472	100
# Units:	181	100	97	100	97	100	120	100	98	100
			High Windthrow Risk Area							
Acres:	1,896	18	1,019	17	1,130	20	1,337	18	786	14
# Units:	49	27	29	30	26	27	32	27	20	20

[1] Total unit pool includes all the units that are in at least one alternative.
[2] Harvest acres include road right-of-way acres.
Source: Jenkins 1995b

Cumulative Effects

Most of the Port Houghton/Cape Fanshaw project area is designated by the TLMP as amended for intensive development to promote industrial wood production. There is currently no additional proposed harvest (through the year 2010) within or surrounding the project area on National Forest lands.

The project area is bordered by saltwater to the south and west, and by wilderness to the northeast. Hobart Bay, which is the first bay north of the project area, was part of the Native selected lands and has been heavily harvested. Harvest activities are scheduled to be completed by 1997. The exact amount of harvest is unknown on these private lands but has been assumed for this EIS to be completely harvested under existing conditions, and would occur prior to harvest activities initiated for the proposed project. No timber sales, other than the one for this project and the Goldbelt, Inc. harvest, have been identified for the project area or land surrounding the project area. When the Goldbelt, Inc. harvest is complete, more roads would be available for use by the Forest Service to harvest in the North Shore area and transport timber at the Hobart Bay LTF.

Marine (Issue 3)

With the exception of the Hobart Bay LTF site, which is located outside of the Port Houghton/Cape Fanshaw project area, there are no existing LTF sites within

the project area or its immediate vicinity. For the Port Houghton/Cape Fanshaw project, up to three LTF sites may be used for an action alternative. The volume of timber transferred from each LTF site varies by alternative with most of the timber being transferred through the Little Lagoon site (Table 2-1).

LTF sites consist of several facilities such as the log-entry system, log rafts, dock for float plane landing and boat storage, timber sort yard, storage building, and logging camp. Two log-entry systems are being considered for each LTF site at Port Houghton, although only one system would ultimately be selected for each site. These log-entry systems are the low-angle slide and the bulkhead. The systems transfer logs from the land to water for rafting. The bulkhead system additionally has the ability to transfer logs to a barge. Logs can be transferred singly or in log bundles.

Logs may be sorted on land or in the water. For the proposed project, land-based sort yards are available at all three LTF sites, if needed, although the size of land-based sort yards is limited at Rabbit Cove and North Point.

The primary use of log rafts is to transfer logs from the logged area to a processing and/or scaling facility. For this project, tugboats would transfer the log rafts from Port Houghton to a timber processing facility. Alternatively, logs can also be transferred out of the project area on barges. For the proposed project, small temporary log-rafting areas would occur at the North Point and Rabbit Cove LTF sites. The rafts at these LTF sites would be short-term and moved to the Little Lagoon LTF site where they would be stored with the other rafts to be transferred to the wood processing facilities. At least five to six tugboats and/or barges would be expected to navigate Port Houghton on a weekly basis during the peak harvest period for the one or more timber sales that could result from this project.

Logging camps may be either land-based or on barges. However, no locations are available for land-based camps at North Point or Rabbit Cove. It is possible that those employees using the North Point or Rabbit Cove LTF sites could camp at the Little Lagoon LTF site. Alternatively, a floating log camp could be located south of the North Point LTF site at the mouth of unnamed streams #6 and #7 (Good 1995b) or in a bay just west of Rabbit Cove. The log camps would be in operation for six months a year - from May to October. Float planes, helicopters, and small boats would be associated with the log camp.

The number of sites used for log transfer at any given time depends on the timber market and harvesting schedules. Most LTF sites are used intermittently; a site may be built for a specific harvest period, then after the harvest is completed, the lease may either be kept active for future timber harvests or allowed to terminate. The Little Lagoon LTF site would be available for future harvests in the project area, although no future sales are planned at this time. In comparison, the North Point and Rabbit Cove LTF sites are project specific, and no timber is expected to

be transferred through these sites at a future date. These latter sites would be permanently closed following timber harvest for this project.

Direct dropping of logs into saltwater by helicopters would occur in offshore areas under Alternative D. This alternative proposes use of helicopters to place the logs directly into the water in the area between Sandborn Canal and North Point. Deep areas (>60 feet) would be chosen for drops. The helicopter drop zones would be marked by buoys and log booms to capture floating debris generated by water drops to avoid water hazards to traffic.

A contractor would have two options for harvesting the area from Sandborn Canal to North Arm under Alternative D. Contractors could drop logs directly into saltwater rafts, tow them to the Little Lagoon LTF, take them back out of the water to the sort yard, remove the remaining limbs, rebundle and place them into the water again. The second option would be to drop the logs directly into the water or onto a barge and use the barges as the platform for limbing and transporting. The limbs would then be flown back into the areas of harvest to be disposed of. This process increases both the barge and air traffic that would occur in the Port Houghton area.

Direct Effects

Physical effects from log dumping, sorting, and rafting would include bark and wood debris deposition, changes in marine substrate characteristics from bark accumulation, and loss of whole logs through sinkage. The extent of impacts from these activities would vary with the type of log entry system, water depth, substrate composition, log species handled, season and volume of the operation, and prevailing currents and circulation patterns (Duval and Slaney & Company 1980, Waldichuk 1979).

Construction

The most direct physical effect on the substrate occurs during construction when intertidal and shallow subtidal habitat is filled for the LTF site. The extent of fill is dependent on the type of LTF system selected. Generally, approximately 60 horizontal linear ft of shoreline, and a vertical area from the Ordinary High Water (OHW) mark to about -5 ft Mean Lower Low Water (MLLW) would be filled for the LTF. However, the total area of shoreline filled from OHW to -5 ft MLLW is influenced by beach slope in the intertidal and shallow subtidal area. In general, construction of an LTF on gently sloping beaches would result in more marine habitat being filled than construction on steeply sloped beaches.

The greatest area of fill for the LTF sites planned in the project area would occur under Alternative C when all three LTF sites would be constructed, resulting in a range of 0.33 to 0.63-acre of intertidal areas filled for construction of either of the two log-entry systems (Table 4-8). Alternative C would also require filling an additional 0.5 acre of intertidal area at the North Point LTF to construct a log sort

yard. Alternative B would require construction of both the Little Lagoon and Rabbit Cove LTFs (0.2 to 0.3-acre fill). Alternatives D and E would require the development of only the Little Lagoon LTF site (0.11 to 0.15-acre fill).

Table 4-8

Intertidal and Shallow Subtidal Fill Area (Acres) by LTF and Type of Log-Entry System

LTF Site	Vertical Bulkhead	Low-Angle Slide
Little Lagoon	0.15	0.11
North Point	0.09	0.15
Rabbit Cove	0.13	0.33

Source: McKenzie 1995b

Bark Deposition and Dispersion

Bark loss occurs during the transfer of logs from land to water. Bark is deposited in the intertidal area immediately below the log-entry system where currents disperse the bark over a greater area. The low-angle slide system moves logs from land to water on a slide at relatively low velocities resulting in some bark loss. Bulkhead systems result in less substrate disturbance and bark loss because a crane lifts the logs from land and deposits them into the water. Thus, low-angle slides have a higher bark loss rates than bulkhead systems. Schaumberg (1973) reported average bark losses of 17 percent for a low-angle slide and 7 percent for a bulkhead system. Bark can also be deposited when logs are sorted in the water. Bark falls off logs as the boat sorts the logs into different areas of the log raft. The bark initially falls immediately below the surface water; it is dispersed over time on the marine substrate by means of currents.

The greatest estimated area of bark deposition and dispersion would occur at the Little Lagoon LTF site, if a low-angle slide were constructed (Table 4-9). Less bark deposition and dispersion would occur at the Rabbit Cove LTF site (Alternatives B and C) and the North Point LTF site (Alternative C only) because of the lower timber volume that would be transferred through these sites (Table 2-1). Bark deposition and dispersion would be restricted to the Little Lagoon LTF site for Alternatives D and E. In addition, miscellaneous bark deposition would occur in smaller amounts directly below log rafts. Results of previous studies (Conlan 1975, 1977; Shultz and Berg 1976; Pease 1974) indicate that bark and wood deposits occur at both active and abandoned LTF sites, indicating that bark remains underwater at LTFs for long periods of time following LTF closure. The depth of bark accumulation could be variable, ranging from scattered deposits of decomposing wood and bark debris within depressions to accumulations several feet deep.

Table 4-9

Estimated Area (acres) of Bark Deposition and Dispersion at the LTF Sites

LTF Site	Transfer System	Area of bark deposition	Area of bark dispersion
Little Lagoon			
	low-angle slide*	0.17	0.83
	bulkhead	0.11	0.52
Rabbit Cove			
	low-angle slide	0.03	0.17
	bulkhead	0.01	0.17
North Point			
	low-angle slide	0.03	0.17
	bulkhead	0.01	0.17

*Log entry into the water using a low-angle slide system typically results in more bark deposition.
Source: McKenzie 1995b

A correlation between the size and volume of bark deposits, the amount of timber transferred, and years since the LTF has operated has been shown to be important at inactive LTFs evaluated in Southeast Alaska (Freese et al. 1988). Pease (1974) reported bark deposits from 24 to 35 inches (in.) deep at a ten-year-old active site and 2 to 3 in. deep in a one-year-old LTF site. Bark was dispersed at an approximately 180-ft radius from the point where the log bundles entered the water. The radius of dispersed bark was reduced to a 45- to 70-ft radius at LTF sites abandoned for several years. Conlan (1977) reports thicker deposits occurring in the immediate proximity to the dumps (LTFs), and thinning with increasing distance from the LTF sites. Pease (1974) and Ellis (1970) report that slow bark debris dispersion could occur in areas with poor water circulation.

Although attempts were made to obtain current water data for Port Houghton, no water current data was available. The bark dispersion area could increase if strong water currents frequently occur in the vicinity of the LTF sites; as the depth of bark deposits is expected to decrease with increasing current speeds. Comparatively, in areas with relatively slow water currents and low water exchange volumes, the depth of bark deposits is expected to remain relatively unaltered, and the bark dispersion area is not expected to exceed estimated areas (Table 4-9).

Marine Flora and Fauna

The most substantial biological impacts to marine flora and fauna caused by the construction and operation of LTFs are (1) the direct loss of plants and animals

within the fill area of log-entry systems, and (2) a reduction in plant and animal communities in bark deposition sites below log-entry systems and log rafts.

The greatest impact projected to marine macroalgae communities in the vicinity of LTF sites would be elimination of macroalgae in the fill area and a decrease in marine community diversity from shading directly below log rafts. The amount of macroalgae eliminated from filling intertidal and shallow subtidal habitat would depend on the density of macroalgae within the fill footprint. Decreased light intensity under log rafts reduces primary productivity and growth, eventually leading to the loss of macroalgae and rooted marine plants. Ellis (1980) reported a marked decrease in plant abundance caused by shading at a log-raft area in Hanus Bay, Southeast Alaska. The effect of shading for the proposed project is based on the size of the log-raft area and number of LTF sites planned. Log-raft areas are likely to be of similar size at the Little Lagoon LTF site regardless of which action alternative is implemented. Log raft shading of approximately 0.2 acre at the Little Lagoon LTF site is expected. Shading would also occur below log rafts at the Rabbit Cove and North Point LTF sites, although the size of the log raft area would be considerably less based on the timber volume to be transferred at these sites. Floating log camps at either of the three LTF sites would shade approximately 0.11 acre of marine habitat, if the camps are established.

Other impacts to macroalgae and rooted marine plant communities would occur from bark and wood debris covering plant communities (Table 4-9). Log dumping and bark loss into marine substrates result in a shifting, unstable environment that is harmful to marine plants both in overall abundance and species richness (Shultz and Berg 1976; Duval and Slaney & Company 1980). The action alternative likely to cause more impacts to marine plants is Alternative C, based on the number of LTF sites required.

The depth of bark deposits in marine waters may have the greatest impact on changes in faunal abundance, species richness, and community structure. A minimum bark depth of 1 to 2 in. would result in changes in species distribution and numbers, and the effect of bark deposits may last for several decades (Karau 1975; Pearson 1972; Robinson-Wilson and Jackson 1983). Bark depth is generally greater in log dumping areas than at log rafting areas, and therefore is controlled by timber volume transferred at LTF sites. The greatest amount of marine area, having at least 2 in. of bark accumulation, would occur at the Little Lagoon LTF site, irrespective of which action alternative is implemented. An estimated 0.11 to 0.17-acre of bark deposits (Table 4-9) would accumulate. Bark accumulations greater than 2 in. are not anticipated at the Rabbit Cove and North Point LTF sites because of the low timber volume to be transported at the sites.

Herring Spawn Areas

The herring spawn grounds (Appendix K) located 3,168 ft northeast of the Little Lagoon LTF site would not be impacted because bark and wood debris are not expected to disperse greater than 180 ft from the LTF site. The wood and bark debris that would reach this herring spawn site is similar to natural detritus deposition that occurs on a daily basis. The location of a large rock pinnacle about 280 ft northeast of the Little Lagoon LTF site is likely also to prevent bark debris from dispersing towards the herring spawn area. Locating a floating log camp in a documented herring spawn area in North Arm, 2 miles east of the North Point LTF site, is expected to reduce the abundance of macroalgae from shading below the floating log camp and preclude herring spawn.

Alternatives include locating a floating camp on the northwest side of the coast half-way between the unnamed streams and the North Point LTF site, or not locating a floating camp to service the North Point LTF and using the floating camp at the Little Lagoon LTF site as a base of operations.

Dungeness Crab

Low densities ($<1/m^2$) of dungeness crab were observed at the LTF sites in summer 1994. The closest crab pots observed near LTF sites were at the mouth of the Salt Chuck 2.5 miles north of the North Point LTF, 1 mile west of Little Lagoon, and 1 mile west and south of the Rabbit Cove LTF site in Sandborn Canal. Impacts to commercial and recreational densities of dungeness crabs are not expected because bark and wood debris would not disperse greater than 180 ft from the LTF sites.

Marine Mammals

LTF operations and the transport of log rafts through Port Houghton could potentially disturb feeding whales, dolphins, porpoises, and harbor seals. Two LTF sites (Little Lagoon and Rabbit Cove) are located within 2 miles of known foraging areas near the mouth of Sandborn Canal. Harbor seal haulout sites are located northwest of the mouth of Sandborn Canal about 2 miles from the Little Lagoon LTF site and 1.5 miles from the Rabbit Cove LTF site. While the proposed North Point LTF site is located farther to the east towards the Port Houghton North Arm, log rafting operations from these sites would likely pass directly through the Port Houghton whale feeding grounds. Marine mammals would be unaffected by timber operations in Port Houghton North Arm, the Salt Chuck, Fanshaw Bay, and Farragut Bay because no timber harvest is planned in these areas. The increase in boat traffic in Stephens Passage and Frederick Sound would be insignificant for marine mammals due to the large area of saltwater and the existing boat traffic. Commercial and recreational boating traffic also occur in the project vicinity primarily during summer months. Movement of whales and

use of haulout areas by harbor seals are not anticipated to be obstructed under any of the proposed action alternatives.

Water Chemistry

Potential adverse effects to marine organisms at the LTF sites are not anticipated to be of importance because of the tidal mixing and dilution rates expected at all three LTF sites. Compliance with Section 401 water quality certification under the Clean Water Act would also minimize chemical impacts to marine organisms and habitat. Adverse effects to marine resources could occur from changes in water chemical properties due to leachates from wood and bark debris that enter the water during log dumping. The intermittent use of, and low timber volume to be transported at the Rabbit Cove and North Point LTF sites would minimize leachate accumulation.

No chemical effects to fauna are expected from the proposed harvest. Adequate tidal flushing should preclude high concentrations of leachates from developing in the project area (Levy et al. 1982).

Indirect Effects

Indirect effects associated with LTF construction and operation include the introduction of debris into nearshore waters. This debris would consist of log bundling and rafting straps; bottles, cans, and other refuse; spilled petroleum products from vehicle and boat operations or maintenance; and domestic sewage produced by camps located in the shoreline area. Fuel oil spills from LTFs are generally not common, but could occur and result in contamination of local waters. Most oil-spills are small and occur during fueling operations. Discharge of domestic sewage from temporary log camps could occur and increase the biological oxygen demand (BOD) of receiving waters. However, the effects of sewage discharge are generally localized, short-term, and insignificant (Duval and Slaney & Company 1980). Incidental refuse could be inadvertently disposed of in marine waters at the logging camp and during log entry into the water.

Cumulative Effects

No existing or abandoned LTFs occur in the Port Houghton/Cape Fanshaw project area, and there are no plans at this time for additional LTFs following this timber sale. The Hobart Bay LTF site is located outside of the project area and is operated by Goldbelt, Inc. From 4.3 to 12.5, MMBF would be transported through the Hobart Bay LTF site under Alternatives B, C, and D.

The construction and operation of three LTF sites in Port Houghton would be the first major in-water development activity for the project area and could result in more cumulative effects over the project area on marine resources and habitats. Bark and wood debris would accumulate at all three sites. Dispersion of wood and bark could result in impacts to marine resources that move through and use the LTF areas. The North Point and Rabbit Cove LTF sites would likely be closed following this timber sale. These sites would be restored to previous conditions to the extent possible. The Little Lagoon LTF site may be maintained

if a second timber harvest is planned and permitted for this area beyond the year 2010.

Wildlife (Issue 4)

Direct and Indirect Effects

The proposed timber harvest in the project area would result in the harvest of old-growth forest. As proposed in the silvicultural prescriptions for each harvest unit, some units would be only partially harvested i.e., harvested at less than 100 percent. The analysis presented in the impact section below assumes that disturbance to wildlife would occur in all unit and road areas planned for construction (Table 4-10).

Table 4-10

Maximum Disturbance Acreage Projected From Timber Harvest

	Alternative			
	B	C	D	E
Units	5,785	5,284	6,982	5,203
Roads	252	334	262	268
LTFs[1]	17	21	16	16
Total	**6,054**	**5,639**	**7,260**	**5,487**

[1] Includes roads and sort yards in the vicinity of the LTF, but does not include camps because either a land-based or floating camp may be selected by the timber sale operator. Total acreage impacted represents 4 to 5 percent of total area managed by the Forest Service (136,906 acres).

Source: Gunther 1995c

For the wildlife habitat analysis, acreages of habitat types remaining after timber harvest are based on the updated TIMTYP layer as described in Jenkins (1995a). Although forest volume class 3 includes clearcuts (volumes 0 to 8 MBF are considered volume class 3), this category is used only for low-volume old-growth forests when describing wildlife habitat types. The habitat category entitled "clearcut" is reserved for all areas that would be cut for the proposed harvest and for the existing clearcut areas at Goldbelt, Inc. lands. Since not all units will be clearcut, this analysis will represent a worst case scenario.

Wildlife Habitats

Estuary and Beach Fringe - Estuaries and beach fringe are protected from timber harvest, excepting the beach fringe habitat type in the immediate vicinity of each LTF site. About 0.57 acres would be harvested in the beach fringe area at each site for road construction, and additional areas would be harvested for sort yards

and camp facilities. A 100-ft. shoreline visual screen of old-growth forest is planned at all facilities with sort yards immediately behind these buffers. The sort yards occupy 15 acres at Little Lagoon, 3.5 acres at North Point, and 1.8 acres at Rabbit Cove. Development potential is limited at the latter two sites and no additional facilities are planned. Total area of beach fringe harvested is lowest under Alternatives D and E, slightly greater for Alternative B, and maximum for Alternative C, based on the number of LTF sites needed for each alternative (Table 4-11).

Table 4-11

Acres of Wildlife Habitat Types Where Harvest, Road Construction, and LTF Site Development Are Planned for the Action Alternatives

	Alternative			
	B	C	D	E
Saltwater	<1	<1	<1	<1
Estuary	0	0	0	0
Beach Fringe	17	21	16	16
Freshwater	0	0	0	0
Scrub	41	48	80	37
Forest				
Volume Class 3	4	4	4	4
Volume Class 4	1,789	1,723	2,666	1,618
Volume Class 5	2,123	2,036	2,178	2,017
Volume Class 6	2,001	1,735	2,200	1,681
Volume Class 7	22	3	26	69
Bogs, Fens, and Peatlands	55	69	90	45
Alpine	2	0	0	0
Clearcut	0	0	0	0
Total	**6,054**	**5,639**	**7,260**	**5,487**

Source: Gunther 1995c

The Little Lagoon site may additionally have a land-based camp, but it would be located 500 ft. beyond the shoreline and outside the beach fringe habitat. The acreage and specific location of a land-based camp is not shown in Table 4-10 because use of the land-based camp is optional for the timber sale operator. Staff have selected two locations with maximum areas for land-based camps near the Little Lagoon LTF site, but the decision to have a land or floating camp, and the exact camp acreage (up to the maximum acreage allowed) would be requested by the timber sale operator.

<u>Freshwater and Scrub</u> - No changes to the amount of freshwater habitat and minimal changes to scrub habitat would occur from implementation of the action alternatives (Table 4-11). Scrub area impacts are from road construction and low productivity sites within units.

<u>Forest</u> - Timber harvest would alter from 5,203 acres (Alternative E) to 6,982 acres (Alternative D) of old-growth forest to clearcut for harvest units alone. All harvest areas are not clearcut; there are sanitation, salvage and other partial cuts proposed. Additional harvest would occur for road and LTF construction outside of harvest units (Table 4-11). More harvest would occur in Volume Classes 4, 5, and 6 under Alternative D than under the remaining action alternatives; the least harvesting in these three volume classes would occur under Alternative E. Minimal harvest is planned in volume classes 3 and 7, compared to volume classes 4, 5, and 6.

<u>Bogs, Fens, and Peatlands</u> - Impacts to bogs, fens, and peatlands would result from both road construction and timber harvest within units (Table 4-11). Small amounts of bogs, fens, and peatlands (typically less than 2 acres) are located in productive harvest units. These areas would not be cut, but timber would be expected to fall within these areas and human disturbance would occur.

<u>Alpine</u> - Two acres of alpine habitat would be affected by road construction under Alternative B (Table 4-11). No other impacts to alpine vegetation would occur.

<u>Clearcut</u> - Some road construction is planned on portions of Goldbelt, Inc. lands to access National Forest areas. However, new clearcut habitat would be created from unit harvest and road construction. Some of these areas would have reserve trees. Clearcut and disturbance areas are shown in Table 4-10 with Alternative D having the greatest amount of area where logging activities are planned.

Wildlife Corridors

No timber harvest is planned in **estuaries** under any alternative. The Little Lagoon LTF is located between two estuaries approximately 4 miles northwest of the western shore of Sandborn Canal. This LTF would be constructed for all action alternatives. Unit 332050 (33) (6.7 acres) also occurs between these two estuaries that are less than one mile apart. This unit is near the LTF site, and would be used as a rock source for all action alternatives. Noise impacts to adjacent estuaries could result from harvest and rock withdrawal within this unit.

Streamside buffers (a minimum of 100 ft. on either side of Class I and II streams) should allow for wildlife movement along **freshwater** corridors in the vicinity of harvest units. Because buffers are not required on Class III streams, some exposure to direct sunlight at some stream courses would occur depending on the alternative selected (see *Fisheries and Water Resources*). For the proposed timber

harvest, more exposure to direct sunlight would occur under Alternative C (62 miles); the least exposure would occur under Alternative E (44 miles). Direct sun exposure implies minimal cover, a condition most wildlife need for movement and escape from predators. Alternative E would result in more favorable conditions for wildlife use of streamside corridors, particularly during migratory movements.

Corridors in **forested** habitats would be affected by timber harvest. Important forest corridors include the shoreline along the north shore of Port Houghton east of Goldbelt, Inc. lands, the south shore of Port Houghton east of Sandborn Canal, Sandborn Canal, Salt Chuck, and the northwest corner section of North Fanshaw. For all action alternatives, no harvest is planned along the north shore of Port Houghton east of Goldbelt, Inc. lands or within forests surrounding the Salt Chuck. While each action alternative affects different wildlife corridors, no action alternative is more favorable than another in minimizing impacts to important wildlife corridors. Alternatives B and C have no harvest in Sandborn Canal or the northwest corner section of North Fanshaw, but two units and an associated road do occur near the shoreline east of Sandborn Canal. Alternative D has three small helicopter units in North Fanshaw and eight helicopter units east of Sandborn Canal. Alternative E has units in Sandborn Canal but no units in the northwest corner section of North Fanshaw or the south shore of Port Houghton east of Sandborn Canal.

Wildlife dispersal among **scrub** areas is not expected to change based on implementation of the action alternatives, because minimal harvest is planned in these areas and most scrub areas are distant from proposed harvest areas.

Bogs, fens, and peatlands have been generally avoided when developing the action alternatives, although some roads cross these areas and small (typically < 2 acres) bogs, fens, and peatlands are located within units. Most timber harvest is planned in North Fanshaw which has the least amount of this habitat type. The area with the most acreage in bogs, fens, and peatlands (South Fanshaw) has the least amount of timber harvest planned. Movement for wildlife that depend on bogs, fens, and peatlands is not expected to be substantially disrupted by the proposed timber harvest. Noise and human movement during timber harvest would be expected to have a greater impact, and these impacts would more likely affect wildlife movement on a daily basis rather than seasonally or permanently.

Most **alpine** areas would remain unaffected by the timber harvest. However, movement between some alpine areas would be affected, specifically movements between the Fanshaw Range, Dahlgren Peak and Jamestown Peak. Alternative C has units and roads between Dahlgren Peak and the Fanshaw Range, but a travel corridor has been provided between Dahlgren and Jamestown peaks. Alternatives B, D, and E have units and roads between all three peaks that may deter some wildlife movement.

Management Indicator Species (MIS)

Impacts expected to occur to MIS species, based on results from the habitat capability models using timber harvest and road plans for each action alternative, are discussed below. The MIS analysis for the project area includes two WAAs: WAA 1601 (the Stikine portion of the project area) and WAA 2927 (the Chatham portion of the project area) as shown in Figure 3-1. Note that WAA 2927 additionally includes VCUs 78 and 888, a wilderness area northeast of the project area which adds 56,221 acres to the analysis. The Chatham area for the project area is 90,717 acres. Adding VCUs 78 and 888 result in a total MIS analysis area for WAA 2927 of 146,938 acres. WAA 1601 is of 52,950 acres.

The MIS analysis shown in this EIS is for clearcut conditions directly following timber harvest. The MIS models, as currently written, do not estimate carrying capacity or habitat suitability for partial harvests. In addition, the proposed harvest is increasingly complex because timber volume remaining varies in increments from 0 to 75 percent which each species would respond to in a unique manner. Some MIS species may accept and adapt to partial harvests over time, although the immediate response may be direct avoidance due to human disturbance and extent of slash (logging debris). The slash may inhibit movement by larger animals because it prevents escape from predators. Smaller animals can use the slash as escape cover. As the slash decomposes, an opposite response would be expected. Larger animals can more rapidly escape from predators and smaller animals may lose the cover previously afforded by the slash.

For the MIS models, the larger salvage and group selection areas (where harvest would represent 25 percent of timber volume) were included or excluded based on known species responses to partial harvests during the critical time periods for which the models are based. For example, the open-canopy forest created by group selection methods is not believed to be of value in intercepting snow, and would discourage deer use during the critical winter months. Therefore, group selection and salvage areas were included in the MIS analysis for deer. This would result in the group selection and salvage areas having a negative effect on deer carrying capacity and habitat suitability. Alternatively, red-breasted sapsuckers have been found to be twice as abundant in low volume old-growth stands as in mid-volume stands (Hughes 1995). Group and salvage areas were therefore not included in the model. This would result in group and salvage areas not having a negative effect, but also not having a positive effect either. The latter model would need to be rewritten to show a positive effect.

Because of the complexity of the proposed timber harvest, in terms of amount of volume removed and type of logging system planned, the MIS effects analysis should only be viewed as a comparative basis among alternatives, not as a direct estimate of changes in carrying capacity or habitat suitability. Furthermore, as forest regeneration commences and a second growth-forest emerges, each MIS

species would respond in a unique manner for each of the several types of harvests planned in the project area. Species response is also dependent on conditions within a stand and whether closed second-growth stands are thinned to allow adequate understory development, a condition vital to many wildlife species. An MIS analysis of how each species responds to these conditions following regeneration is not possible because of the numerous factors that the models currently do not include and the unknowns regarding future stand conditions.

Sitka Black-Tailed Deer - Timber harvest in the project area would reduce the Sitka black-tailed deer carrying capacity in the 3 to 14 percent range (Table 4-12). No high value habitat occurs for deer but marginal habitat would decrease and unfavorable habitat would increase (Appendix H). Both WAA 2927 and 1601 would have carrying capacities greater than 500 deer, the minimum required by ADF&G to achieve deer population objectives. The WAA with a carrying capacity nearest to 500 deer following timber harvest would be WAA 2927 with a carrying capacity of 505 deer under Alternative D.

No or few additional hunters are expected to use the project area, despite the increased access from roads, because of the low deer density and existing low hunting success in mainland areas. Hunting impacts from the logging camp may be similar to present levels with the Hobart Bay logging camp which is projected to close by 1997 before the start of the proposed harvest for the project area. However, the logging camp could remain open if more timber is located for harvesting.

No harvest is planned on Robert Island or the southwestern portion of Cape Fanshaw which have historically been cited as having the largest antlered deer in Southeast Alaska.

Mountain Goat - Following timber harvest, the carrying capacity for mountain goats would be expected to change in WAA 1601 by one to two goats, and would decrease in WAA 2927 by four to seven goats (Table 4-12). The decrease in carrying capacity is projected to occur because of increased road density and the loss of wintering foraging areas. Removal of old-growth forest decreases available forage and lowers the quality of goat wintering sites when snowpacks are present (Fox and Schoen 1989). Another impact to mountain goats from road construction is the potential for increased human access leading to increased legal harvest, disturbance, and illegal harvest (Quaedvlieg et al. 1973; Foster 1977; Phelps et al. 1983). Historically, mountain goat hunting has not been considered a major Alaska big game sport because of travel constraints restricting hunter access to goat habitat. The increased roads may attract more hunters to the area, although the distance from user communities, and the lack of connecting mainland roads, would continue to limit hunter interest. An additional impact to mountain goats is aircraft noise from float planes and helicopters used during the timber harvest.

Table 4-12

MIS Carrying Capacities (by Numbers of Individuals) in the Port Houghton/Cap Fanshaw Project Area

Species	Alternative A[1]		Alternative B		Alternative C		Alternative D		Alternative E	
	WAA 2927	WAA 1601	WAA 2927	WAA 1601	WAA 2927	WAA 1601	WAA 2927	WAA 1601	WAA 2927	WAA 1601
Gray Wolf	4	5	4(0)[2]	5(0)	4(0)	5(0)	4(0)	5(0)	4(0)	5(0)
Sitka black-tailed deer[3]	588	1,879	507(14)	1,806(4)	532(10)	1,827(3)	505(14)	1,804(4)	527(10)	1,825(3)
Mountain goat	282	28	278(1)	26(7)	275(2)	27(4)	277(2)	26(7)	277(2)	26(7)
Black bear	188	90	175(7)	82(9)	172(9)	71(10)	176(6)	82(9)	176(6)	82(9)
Marten	229	142	218(5)	135(5)	219(4)	137(4)	215(6)	135(5)	217(5)	137(4)
Land otter	67	30	67(0)	30(0)	67(0)	30(0)	67(0)	30(0)	67(0)	30(0)
Bald eagle	185	78	185(0)	78(0)	185(0)	78(0)	185(0)	78(0)	183(1)	78(0)
Red squirrel	9,192	5,675	8,645(6)	5,413(5)	8,621(6)	5,410(5)	8,586(7)	5,395(5)	8,595(6)	5,399(5)
Vancouver Canada goose	145	131	138(5)	127(3)	138(5)	127(3)	137(6)	127(3)	137(6)	128(2)
Red-breasted sapsucker	9,192	5,675	8,645(6)	5,413(5)	8,621(7)	5,410(5)	8,586(7)	5,395(5)	8,595(6)	5,399(5)
Hairy woodpecker	1,581	649	1,466(7)	593(9)	1,478(7)	609(6)	1,451(8)	591(9)	1,467(7)	607(6)
Brown creeper	6,585	4,066	6,194(6)	3,878(5)	6,176(6)	3,876(5)	6,151(7)	3,865(5)	6,158(6)	3,868(5)

[1] No action alternative—existing conditions.
[2] Numbers in parentheses represent percent decrease from existing conditions.
[3] Canopy closure 25-30 years after timber harvest could result in an additional 30-80 percent decrease in habitat capability in clearcuts depending on elevation and snow conditions.
Source: Gunther 1995c

Units and roads close to suitable mountain goat areas include Unit 381140 (18) (and associated road) directly north of suitable goat habitat on the north shore of Port Houghton. This unit and road occur in Alternatives B, C, and D. The associated road would connect to existing Goldbelt, Inc. roads originating from the Hobart Bay logging camp. Road access would then be provided directly north of suitable goat habitat. Existing Goldbelt, Inc. roads currently terminate 1.2 miles from suitable mountain goat habitat. However, with the expected Goldbelt, Inc. harvest of a recent land exchange (Interim Conveyance No. 1583 dated April 28, 1994) between the Forest Service and Goldbelt, Inc., roads planned in Easement No. 5 would be 0.75 miles from suitable mountain goat habitat.

Jamestown Peak and Dahlgren Peak are suitable mountain goat habitat areas. Road 6130 would traverse directly across (east to west) any mountain goat travel corridor (north to south) between the two peaks. This road section is partially eliminated in Alternative C, but occurs in all other action alternatives. For Alternative C, Units 27102 (151) and 27103 (158) occur directly between the two ranges; however, a travel corridor has been provided east of these two units, and seven units (29111 to 29115 [134, 155, 167, 154, 150], 27113 [164], and 29121 [172]) are excluded from this alternative to provide a 1.75-mile-wide travel corridor between the two peaks and to minimize human disturbance in this area.

In comparison, Alternative D would result in the maximum harvest in the area between Dahlgren and Jamestown peaks. Under this alternative, three units would be harvested, two roads constructed, and selected trees would be harvested in the salvage area. The latter areas are directly south of suitable mountain goat habitat, and Road 6130 is within 0.2 miles of suitable mountain goat habitat. Alternative B is similar to Alternative D, except that one unit and associated road would not be harvested. Alternative E has two units and associated roads within the mountain goat travel corridor.

Suitable mountain goat habitat also occurs directly east of Sandborn Canal, and south and west of Washington and Lincoln Peaks. The closest unit north of this suitable habitat is Unit 341118 [30] (under Alternatives B and C). The road associated with this unit is 1.25 miles north of the northernmost portion of suitable mountain goat habitat. Topography between the harvest area and suitable goat habitat is steep and rugged. The proposed harvest of this unit and road is not expected to affect mountain goats in this area either through disturbance or access. However, there are five units (Units 341112 to 341115 [136, 130, 119, 103], and 341114S [126]) and associated roads between two distinct areas of suitable mountain goat habitat near the southern portion of Sandborn Canal. These units and roads would be harvested only under Alternative E.

Suitable mountain goat habitat also occurs in VCU 79, but it would not be entered for harvest under any alternative. Other suitable mountain goat habitat is near Saranac and Man-of-War peaks. No timber harvest or roads are near these

mountain goat areas nor would they provide better human access for hunting than the existing boat access from the shoreline in these areas.

The existing goat carrying capacity is 282 goats in WAA 2927 and 28 goats in WAA 1601. The minimum viable population for a WAA is estimated to be 50 goats (Suring et al. 1993). Goats are vulnerable to human disturbance and road construction that may disrupt important travel corridors needed for dispersal and reproduction. Declines in goat populations have been previously observed in areas of increased human disturbance and road construction, even when habitat loss did not occur (Quaedvlieg et al. 1973; Foster 1977; Phelps et al. 1983). Helicopters near mountain goat foraging areas are also believed to negatively effect mountain goat habitat use (Chadwick 1974). Suring et al. (1993) recommend that viable populations of mountain goat are supported through identifying winter habitat during project planning and maintaining 100 percent of the habitat capability in these areas as described by the mountain goat habitat capability model.

For discrete populations of greater than 50 animals, Suring et al. (1993) recommend that potential habitat capability is maintained to support at least 50 animals. For the proposed project, suitable habitat would be reduced by 588 (Alternative D) to 838 (Alternative C) acres, and marginal habitat would be increased by 464 (Alternative D) to 720 (Alternative C) acres (Appendix H). Thus, the suitable habitat that is lost is mostly altered to marginal habitat. No units or roads occur in suitable habitat for Alternatives B, C, and D; however, suitable is reduced due to the use of the 2-mile road buffer in the habitat capability model that is used to account for human-induced disturbance. Within this 2-mile road buffer, HSI values are reduced by 20 percent. Suitable habitat that is affected by this road buffer is primarily near Dahlgren Peak. For Alternative E, units are either immediately adjacent to or within suitable habitat areas. These six units consist of Units 341112 to 341116 (including 341114S) (136, 130, 136, 119, 103, 122), and are within the suitable goat habitat areas near Washington and Lincoln peaks.

The carrying capacity in WAA 1601 is almost half of the minimum of 50 goats needed for viable populations but this recommendation could also be interpreted based on the number of mountain goats known to occur in a specified area. The number of mountain goats that occur at each mountain peak or range in the project area is difficult to estimate, but if the surveys represent 50 percent of the adult population, then the known peaks that support mountain goats in the project area are likely to have at least 50 goats (Gunther 1995c), except for Dahlgren Peak. The highest number of goats observed on this peak is 22 goats (summer 1994). Assuming the 22 goats observed represent 50 percent of the total population, then 44 goats occur on this peak.

<u>Black Bear</u> - Carrying capacity for black bear would decrease by up to 25 bear (WAAs combined) or up to 8 percent for all action alternatives (Table 4-12).

Existing conditions reflect a carrying capacity of 278 black bear. Slight differences do occur among habitat suitability estimates, although unsuitable habitat remains the same as existing conditions (Appendix H). Suitable habitat decreases to become marginal and unfavorable habitat, while unsuitable habitat remains unchanged (Appendix H). The decrease in carrying capacity and habitat value is primarily due to the loss of mature tree cover which is considered second only to food in determining the suitability of an area for black bears (Landers et al. 1979). The alternative least favorable to black bear is Alternative C, while Alternatives D and E are more favorable considering changes in total carrying capacity (Table 4-12). However, these numbers are within 2 percent of the other action alternatives, and the location of disturbance may be of greater importance than total changes in carrying capacity.

Black bears typically forage near the brushy understory cover provided by open-canopy mature-to old-growth forest stands (Schwartz and Franzman 1983). Most plants preferred by bear occur in large openings, but bear do not move far from the cover provided by mature and old-growth forests when foraging. Thus, only the periphery of open areas, including clearcuts, would be used by foraging bear. Group selection and salvage areas, where a 25 percent cut is planned, are expected to be used by bear, and the slash remaining following cutting could provide good den sites, although slash could obstruct ambulatory movement by young black bears and prevent escape from predators.

More black bears are successfully hunted in the project area than any other big game species. In addition to subsistence hunting, recreational hunting of black bears by out-of-state hunters is of importance. Many of these tourists hunt in the project area because of its remoteness and lack of development or human presence (public scoping comments received in October 1994). Some of these tourists may be deterred from returning to the project area once timber harvest is initiated. Alternatively, other hunters who previously did not use the project area because of its lack of roads may be attracted to hunting bear in the project area once roads are constructed. The more open character of the harvest units and roads would provide better viewing opportunities of bear that forage near unit openings than would the closed canopy forest. Logging camp residents for the proposed harvest may also hunt bear.

<ins>Brown Bears</ins> - The proposed timber harvest is not located in areas where brown bears have historically been sighted; i.e. the Glenn Creek Watershed and Farragut Bay vicinity. No impacts to this species are expected.

<ins>Marten</ins> - Loss of old-growth forests from timber harvest would decrease marten carrying capacity from 4 to 6 percent in each WAA (Table 4-12). Alternative D would have the greatest impact, but the change is within 1 percent of the other action alternatives. Suitable and marginal habitat is decreased while unfavorable habitat is increased (Appendix H). The loss of suitable habitat ranges from 1,545 (Alternative C) to 2,040 (Alternative D) acres. Alternatives B and D have more

substantial impacts because marten are not believed to forage or breed in the salvage or group selection areas even if only 25 percent of the area is harvested. Marten avoid conifer forests with less than a 30 percent canopy cover, and they rarely move more than 30 ft into treeless meadows (Spencer et al. 1983). Hargis and McCullough (1984) state that openings up to 440 ft may be crossed by marten if scattered islands of trees are available. Group selection areas for this timber harvest would also be expected to be crossed by marten, but they would not consider these areas suitable habitat.

The average annual marten harvest in the project area is 6 marten from 1988 to 1993. The increase in roads may cause an increase in trapping, although most hunting of marten is within 500 ft. of a shoreline that is easily accessible by boat and travel on foot. It is possible that, with the increased road density, each hunter would have the opportunity to hunt more efficiently and trap more marten.

River Otter - Suitable habitat and carrying capacity for the river otter is expected to be similar to existing conditions for all action alternatives (Table 4-12). Suitable habitat decreases slightly to unfavorable habitat but it is not substantial enough to reduce the carrying capacity (Appendix H). These changes occur primarily in inland areas considered suitable habitat by the model. Larson (1983) and Woolington (1984) state that river otter activity occurs within 100 ft. of the shoreline, although female otters may use inland habitats within 0.5 miles as natal denning sites. In addition, all proposal LTF sites show significant use by river otters who would either be lost by construction and operation of the facility or displaced. These LTF areas are very small in total acreage used and are not enough to affect overall carrying capacity.

Bald Eagle - An interagency agreement (#89-010) between the USDA-FS and USFWS provides for protection of bald eagles through preservation of a 330-ft.-radius habitat management zone around each bald eagle nest tree. The agreement also requires timing restrictions on blasting within 0.5 mile of known nests. No activities are planned within 330 ft. of any active bald eagle nest for the proposed project. Exclusive of proposed LTF sites, no units or roads are within 500 ft. of the shoreline or 1,000 ft. of estuaries. One historical bald eagle nest location (abandoned since the early 1980s with the nest no longer present) is within 330 ft. of the Little Lagoon LTF site. A variance would be required from the USFWS because the nest historically occurred in the vicinity of the LTF.

Other potential impacts to bald eagles may result from human noise and disturbance. This could occur primarily at the LTF sites since no harvest units are near existing nests. Disturbance may be greater from a land-based camp rather than a floating camp. Helicopter use at the camps could disturb eagles as the helicopters descend to and ascend from the camp while transferring employees. Recreational disturbance also disturbs eagles through (1) altering the distribution of eagles, (2) disrupting nest-attentiveness patterns, (3) causing

abandonment of breeding territories, (4) reducing productivity, and (5) affecting foraging (Knight and Skagen 1986). McGarigal et al. (1991) determined that recreational boating has the potential for significantly influencing foraging patterns of eagles. It is thus important to locate human activity away from bald eagle nests.

The habitat capability model for bald eagles shows no differences in bald eagle carrying capacities from existing conditions for Alternatives B, C, and D (Table 4-12), while the loss in carrying capacity of two bald eagles is predicted for Alternative E. Nests have not been observed in these areas either by the USFWS or by field biologists during summer 1994. Bald eagles are not believed to nest in these areas. The model also predicts a loss of suitable habitat from 15 to 28 acres (Appendix H), although these losses occur in inland areas not known to support bald eagle nests.

<u>Red Squirrel</u> - The red squirrel is the most abundant wildlife species of all MIS with a carrying capacity of 106,273 individuals (Gunther 1995a). The proposed timber harvest would decrease the carrying capacity from 3 (Alternatives B, C, and E) to 5 (Alternative D) percent within each WAA (Table 4-12). Suitable habitat is minimal in the project area and reductions in suitable habitat range from 77 to 105 acres (Appendix H). Harvesting would decrease suitable and marginal habitat and increase unfavorable habitat. Red squirrels are dependent on conifers as their primary food supply and use large diameter trees with a dense branching structure for nests. The reduction in carrying capacity is due to the harvest of old-growth forest. Studies of red squirrel populations following harvest show that populations decline significantly (Wolff and Zasasa 1975; Medin 1986). Red squirrels tend to forage along tree trunks, branches, snags, fallen logs, and occasionally, on the ground. The distance between remnant trees in partial-cut units, as well as the decreased cone supply may be of less habitat value than a closed canopy old-growth forest, although red squirrels would be expected to continue to use and breed in these areas.

<u>Vancouver Canada Goose</u> - The Vancouver Canada goose habitat capability model uses the GIS soils layer and distance to water as the primary indicators of habitat suitability in the project area. To account for harvest, the model determines that clearcuts have a 0 habitat suitability. For the proposed Port Houghton/Cape Fanshaw harvest, carrying capacity decreases by 2 to 6 percent in each WAA with greater decreases expected in WAA 2927 (Table 4-12). Suitable and marginal habitat decreases while unfavorable and unsuitable habitat increases (Appendix H). Vancouver Canada geese nest in or near old-growth forests that are in proximity to open water. TTRA stream buffers generally protect geese from habitat loss. No harvest units are within 500 ft. of lakes larger than or equal to 50 acres in the project area. Units are also a minimum of 200 ft. from lakes smaller than 50 acres. Thus, a significant portion of goose habitat is protected from timber harvest. Impacts would occur where harvest occurs adjacent to Class III streams,

where roads cross streams adjacent to old-growth forest, and at forest edges near bogs, fens, and peatlands.

Red-breasted Sapsucker - Unlike hairy woodpeckers, red-breasted sapsuckers prefer low-volume old-growth forests. The habitat capability model predicts a decrease in the red-breasted sapsucker carrying capacity of 5 to 7 percent for each WAA in the action alternatives (Table 4-12). Suitable and marginal habitat decrease while unfavorable and unsuitable habitat increase (Appendix H). The model has not been formulated to account for partial harvests; therefore, it predicts less habitat suitability than would occur in areas that would be only partially cut with an open-canopy forest remaining. Red-breasted sapsucker carrying capacity is near seven times the carrying capacity of the hairy woodpecker (14,867 sapsuckers compared to 2,230 hairy woodpeckers for existing conditions), and this species is considered an important contributor of cavity nests for animals that cannot build but do nest in cavities (secondary cavity nesters). Retaining forest structure in cut areas is of benefit to red-breasted sapsuckers because they forage in live trees and nest in trees that are either alive or recently dead (Bull et al. 1986). Thus, preservation of live trees in clearcuts, rather than snags, is of value to this species. The harvest practice of unit feathering (retaining trees near the clearcut periphery) would create open-canopy forest conditions and is of value to this species.

Hairy Woodpecker - The hairy woodpecker habitat capability model predicts loss of 6 to 9 percent of the hairy woodpecker carrying capacity in the project area (Table 4-12). Suitable habitat decreases from 1,475 to 2,070 acres (Appendix H). Alternatives C and E are expected to have less impact than Alternatives B and D because these latter alternatives include group and salvage areas that are not included in Alternatives C and E. Hairy woodpeckers may use partial-cut areas for foraging summer habitat, but they do not use these areas as winter habitat which the habitat capability model utilizes to predict habitat suitability for this species. The habitat capability model shows no habitat suitability in forest stands of less than 8 MBF/acre. Hairy woodpeckers will use scattered live or dead trees in or adjacent to clearcuts for foraging, but these trees do not provide suitable habitat during the winter months (Dickson et al. 1983). Preferred habitat occurs in stands with timber volumes of 30 MBF/acre or greater. The species is not expected to use group or salvage areas.

Brown Creeper - Timber harvest alternatives would decrease brown creeper carrying capacity by 5 to 7 percent (Table 4-12) because of more unsuitable and unfavorable habitat and less suitable habitat than occurs under existing conditions (Appendix H). Differences among action alternatives are not considered to be greater than natural population fluctuations from severe weather conditions. Haapanen (1965) states that "severe weather and lack of food is the most decisive factor limiting populations of (hole nesting) species wintering in conifer stands." Impacts to the brown creeper are due to their dependence on old-growth trees for

nesting and foraging. The brown creeper prefers old-growth forests with a timber volume of 30 MBF/acre or greater. Alternative silviculture resulting in partial harvests is not expected to benefit this species (Suring 1988d), but the brown creeper would be expected to continue using those areas.

Moose

Any effects to moose from timber harvest are projected to occur from human disturbance, hunting, and actual loss of habitat. The preferred habitat, riparian stands of willow and cottonwood, is lacking in the project area. However, moose do use forested areas associated with spruce, hemlock, and blueberry plant associations, and can become abundant in this habitat type. Wintering habitat considered to be of importance to moose (forested habitat below 1,500 elevation, mid to high timber volume, and slopes of less than 75 percent [Blatt personal communication 1995]) would be impacted from timber harvest. Moose in the project area are wary and quick to move away from human disturbance. Timber harvest and road construction may increase daily movement away from harvesting activities. The presence of new roads in the project area could potentially attract more moose hunters, and the two moose per year successfully hunted historically in the project area may increase.

Marine Mammals

At least 17 species of marine mammals, outside of TES species, may occur in marine waters surrounding the project area as described in Chapter 3. Direct effects are not anticipated to occur, although indirect effects may include temporary noise and barge/boat traffic related to the timber sale. Effects are expected to be insignificant, lasting for less than an hour, as a boat travels through feeding areas. None of these marine mammals are known to breed in the vicinity of the project area.

Log Transfer Facilities and Associated Sort Yards and Camps

No unique and/or uncommon wildlife species, other than the bald eagle, were observed in the vicinity of the LTF sites and associated facilities during 1994 field surveys. No direct impacts or loss of bald eagle nests or foraging areas are expected to occur to this species. All active nests are a minimum of 330 ft. from these sites as required by the Memorandum of Understanding between the USDA-FS and USFWS. Human disturbance to adjacent nests is possible, and measures to minimize these effects are provided in the Mitigation section. An MIS species expected to be displaced in the vicinity of LTF sites is the river otter whose burrows and runways were observed at all sites.

Road Construction and Closure

Road construction and use can decrease wildlife presence through (1) loss of old-growth, (2) noise, (3) human disturbance during construction, and (4)

fragmentation of old-growth forests. Human use of roads may permanently deter wildlife use, particularly for shy species. Roads may be lethal barriers to wildlife when use is extensive. Roads can also result in excessive hunter exploitation. For the project area, roads have been recommended for closure in specific areas to minimize road impacts on sensitive species. (See Appendix C for road management objectives.)

Construction and Operation Timing

Timing of harvest operations can avoid impacts to species that use the project area at specific times of year, and it can minimize disturbance levels to wildlife during sensitive life stages, particularly during breeding. Regulation of construction timing should only occur when it is believed that a species would remain in the area following harvesting and loss of old-growth. Construction and operation timing is also recommended in areas adjacent to sensitive species residing in old-growth forests or uncommon species using any habitat in the project area. For example, construction and human presence in roaded and harvested areas near goshawk, great blue heron, and other sensitive bird nests or uncommon mammal dens should only be conducted following fledgling of young. Construction and operation timing is recommended for the following species: all TES species whose nests and breeding sites have been located, and species considered rare to the project area, as well as the great-blue heron nest located in the project area.

Cumulative Effects

Cumulative effects are the result of changes in the environment caused by the interaction of natural ecosystem processes and the effects of multiple management actions. Wildlife habitat and associated wildlife populations within the project area may be influenced by the result of multiple management options to remove timber and conduct other development activities in the project area, and the combined or synergistic effects of habitat loss in adjacent areas.

Cumulative effects resulting from multiple management actions within the project area could include reductions in habitat capability and wildlife species populations due primarily to: (1) past timber harvest, (2) proposed timber harvest, (3) future timber harvest, and (4) harvest in adjacent areas. For this analysis, it was assumed that no past timber harvest occurred that significantly affected wildlife populations (excepting on Goldbelt, Inc. lands), and no future harvest is planned for the project area up to the year 2010. Beyond 2010, no current timber harvest is planned for the project area but the area would likely be reviewed at a future date and feasibility of logging would be assessed.

The amount and overall extent of harvest in adjacent Goldbelt, Inc. lands is unknown. Current information is that Goldbelt, Inc. will have completed all practicable harvest on their private lands in a few years. Complete harvest of Goldbelt, Inc. lands has been assumed as existing conditions for all action alternatives, and therefore has already been included for all MIS habitat capability models.

Biodiversity (Issue 5)

Direct and Indirect Effects

Old-Growth and Fragmentation

For the biodiversity analysis, old-growth forest is represented by volume classes 5-7, and represents 35 percent of the total project area under existing conditions (Kelley 1995a). Depending on alternative, the proposed Port Houghton/Cape Fanshaw action alternatives impact between 6 and 9 percent of the 51,008 acres of coniferous old-growth forest present in the project area. Changes to old-growth acreages by volume class and project alternative are presented in Table 4-13. The analysis of old-growth habitat considers both high- and low-volume old-growth stands because high-volume forests (volume classes 5 to 7) contain a nearly continuous, dense, deep-crowned canopy, that is especially important to forest-dwelling wildlife species sensitive to forest disturbance and edge conditions. These species would include the Pacific-slope flycatcher, northern flying squirrel, Sitka black-tailed deer, marten, fisher, wolverine, and mountain goat.

Table 4-13
Characteristics of High-Volume Old-Growth Forests Stands for the Port Houghton/Cape Fanshaw EIS Alternatives

						Percent in Patches	
Alternative	Number of Patches	Average Size (Acres)	Maximum Size (Acres)	Total Area (Acres)	Interior Area (Acres)	>100 Acres	>1,000 Acres
A*	220	223	12,400	51,008[2]	20,408	91	75
B	585	80	5,984	46,875	15,357	83	66
C	597	80	3,912	47,870	15,188	82	60
D	557	84	6,237	46,648	15,386	82	60
E	592	80	6,237	47,282	15,416	81	64

[1] Alternative A is the no-action alternative, and represents existing conditions.
[2] Volume classes 5-8. There are 80,979 acres of volume classes 4-7.
Source: Kelley 1995b

Based on assessments of the habitat relationships of 116 bird species that occur in forested areas of Southeast Alaska, old growth is ranked as the most important breeding habitat for 41 bird species, and the most important feeding habitat for 21 bird species (Sidle 1985). Reductions in old-growth forests would thus result in loss of significant habitat for these species. For wildlife that are not dependent on old-growth, other habitats, including successional habitats ranging from the shrub/forb stage through young sawtimber stages, would continue to support these species (Sidle 1985; Della Sala et al. 1993). Bird species diversity within successional habitats is often less than that within old growth habitats; however, pole sized and riparian sapling/shrub successional stages can have greater bird species diversity than old growth stands (Sidle 1985).

Populations of several bird species are likely to increase in successional stands following harvest because successional stands provide preferred feeding and

breeding habitat conditions. Species which would likely increase within successional stands include rufous hummingbird, winter wren, American robin, orange-crowned warbler, MacGillivary's warbler, Wilson's warbler, fox sparrow, and dark-eyed junco (Sidle 1985; Brown et al. 1993).

The location of the unit and road pool for the project area was developed to minimize overall impacts to old-growth-dependent species, such as the northern goshawk, and to preserve some areas of high-volume forest. As a result, large portions of old-growth forest would remain undisturbed. These areas include North Shore east of Goldbelt, Inc. lands, the Port Houghton Salt Chuck and Glen Creek watersheds, and most of South Fanshaw. Thus, fragmentation of old-growth forests has been reduced which should reduce impacts to nesting goshawk pairs outside or adjacent to the unit and road pool. Differences of timber harvested among alternatives (maximum of 1,783 acres) is likely not as important as the exact location of harvest relative to nest locations and preferred foraging areas. Alternative D, the alternative with the most acreage harvested, would also have (1) more alternative harvest area planned with less harvest within units, (2) less road mileage, and (3) more helicopter logging; the alternative would result in less human disturbance than alternatives which affect smaller land areas.

Similar to other habitat types in the project area, old-growth forest is naturally fragmented and interspersed among various vegetation types, particularly bogs, fens, and peatlands. The proposed action alternatives result in additional fragmentation of high-volume old-growth forests. Under these alternatives, the maximum patch size is reduced from about 12,400 acres (existing conditions) to between 3,912 (Alternative C) and 6,237 (Alternatives D and E) acres (Table 4-13). Under all action alternatives, 81 to 83 percent of old-growth forest would continue to be distributed in large (greater than 100-acre) patches (Figure 4-1 and Table 4-13), with 60 to 66 percent of old-growth forest occurring in patches greater than 1,000 acres.

A large percentage of old-growth forest would continue to occur in large patches greater than 1,000 acres and provide habitat to old-growth dependent wildlife. Fragmentation of patches greater than 5,000 acres to patches between 1,000 and 5,000 acres would occur under all action alternatives (Figure 4-1). Fragmentation of large old-growth patches has the greatest potential to affect wildlife species with large home ranges (>5,000 acres) (Table 4-14) because, following harvest, fewer large patches would exist. Species with smaller home ranges would continue to find suitable habitat in the numerous small to medium sized patches. For animals with large home ranges, Alternative E provides about twice the amount of contiguous old-growth in patches greater than 5,000 acres compared to Alternative B or D. Alternative C provides no patch of contiguous old-growth forest in excess of 5,000 acres.

Figure 4-1. Total area of high volume old-growth forest by alternative and patch size.

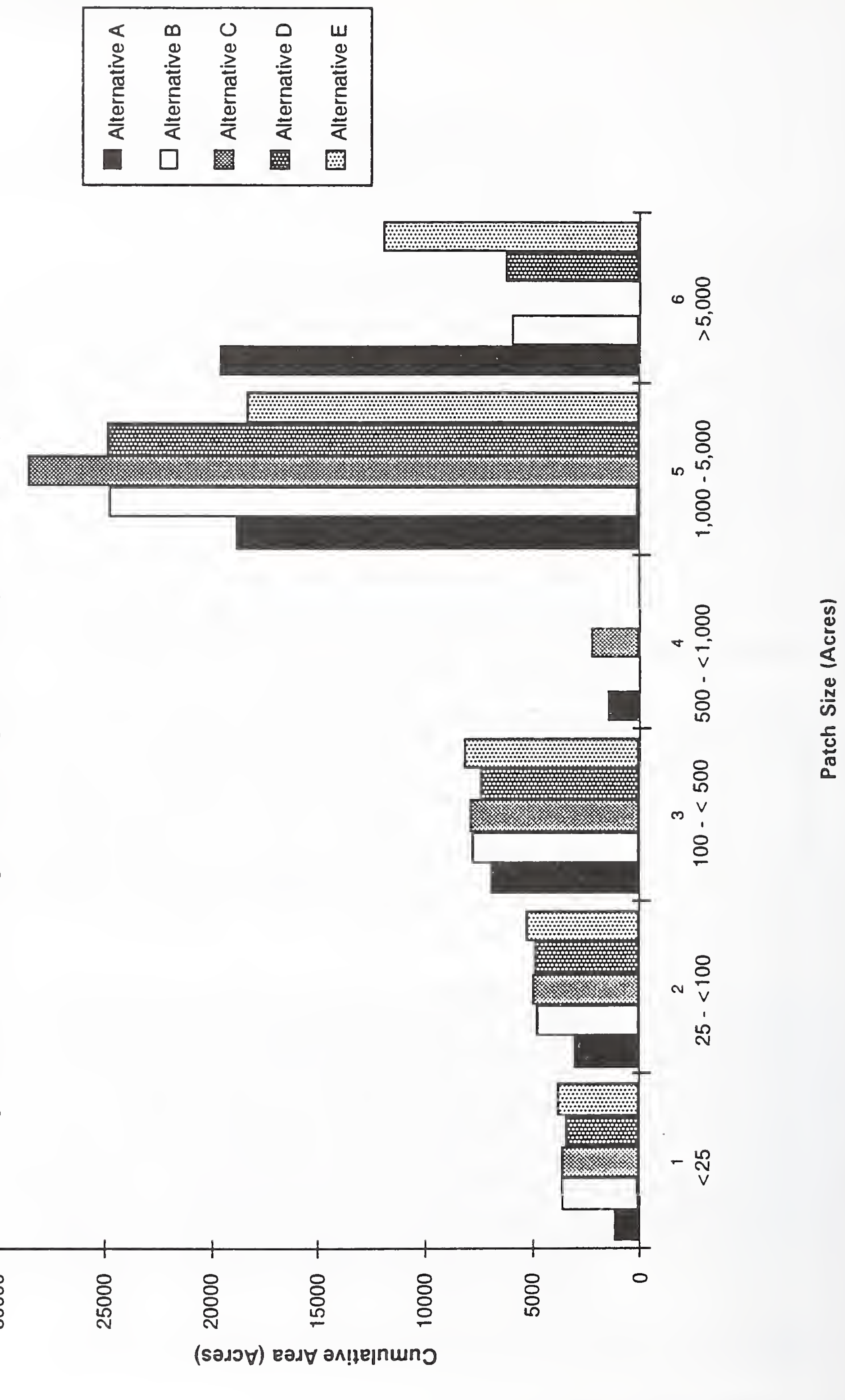


Table 4-14

Wildlife and patch size relationships

Patch Size (acres)	Wildlife that Utilize Patches of Each Size
0 - 25	Hammond's flycatcher, Pacific-slope flycatcher, Stellar's jay, chestnut-backed chickadee, brown creeper, golden-crowned kinglet, Swainson's thrush, dark-eyed junco, pine siskin, red-breasted sapsucker, beaver, voles, red squirrel
25-100	hairy woodpecker, varied thrush, ermine, weasel, northern flying squirrel, northern saw-whet owl, three-toed woodpecker
100-500	bald eagle, sharp-shinned hawk, porcupine, northern pygmy owl
	red fox, marten, Sitka black-tailed deer, red-tailed hawk
1,000-5,000	great horned owl, short eared owl, mountain goat, great blue heron
5,000-10,000	northern goshawk, common raven, fisher, boreal owl, river otter
>10,000	black bear, brown bear, gray wolf, moose

[1]Based on home ranges, territories, and relative densities of terrestrial birds and mammals that use old-growth forests as primary breeding habitat (USDA-FS 1985a; Della Sala et al. 1993).
Source: Kelley 1995b

The increased fragmentation of high-volume old-growth forests results in an increase in edge habitat and a subsequent reduction in interior habitat. The amount of edge versus interior habitat is often difficult to quantify for a variety of reasons (Payne and Bryant 1994), but if edge habitat is assumed to be about a 330-ft perimeter around patches, then the interior habitat of high-volume old-growth forests is reduced approximately 25 percent, from a total of 20,408 acres for all old-growth forests in the project area to between 15,188 and 15,416 acres, depending on action alternative. Since edge habitat is frequently unsuitable for old-growth-dependent wildlife species (such as goshawk, sharp-shinned hawk, and martin), the increase in edge between high-volume old-growth forests and other habitat types is likely to reduce habitat suitability for these wildlife species within smaller old-growth patches.

Loss of old-growth forest habitat due to action alternatives would affect wildlife distribution. While the harvest and fragmentation of existing large irregular old-growth patches would occur under all action alternatives, much of the remaining old-growth patches are expected to continue to function as wildlife habitat and as corridors that facilitate the movement or dispersal of wildlife that depend on old growth. Following implementation of any alternative, volume class 3, 4, 5, 6, and 7 forests would continue to be well distributed through much of the non-alpine portions of the project area. A large percentage of this forest would continue to occur in large patches greater than 1,000 acres and provide habitat for old-growth-dependent wildlife.

Habitat Preservation and Wildlife Retention

The Tongass Land Management Plan as amended (USDA-FS 1986) has identified the preservation of specific amounts of forested old-growth habitat, by VCU, in the Port Houghton/Cape Fanshaw project area for future timber harvest planning (Table 4-15). This habitat, which is identified for wildlife retention, is set aside from harvest and road construction for the duration of the project. For the proposed harvest, the acres can be met for all action alternatives through the old-growth forests retained in stream buffer areas mandated by the Tongass Timber Reform Act, estuaries (1,000 ft of the shoreline), and beach fringe (500 ft of the shoreline) (Table 4-15), except for VCU 88, which is not planned for harvest or road construction.

Table 4-15

Comparison of Retention Requirements of TLMP with the Acreage Planned for Retention Under the Action Alternatives

VCU	Retention Acres*	Acres Set-Aside for Retention: Beach	Estuary	TTRA Buffers	Total
79	1,131	1,104	936	514	2,554
80	91	214	0	54	268
81	19	0	0	0	0
82	539	105	114	576	795
83	162	163	397	464	1,024
84	337	425	988	270	1,683
85	407	361	35	8	404
86	380	111	127	289	527
87	367	26	107	615	748
88	501	205	85	41	331
89	334	408	438	605	1,451
Totals	**4,268**	**3,122**	**3,227**	**3,436**	**9,785**

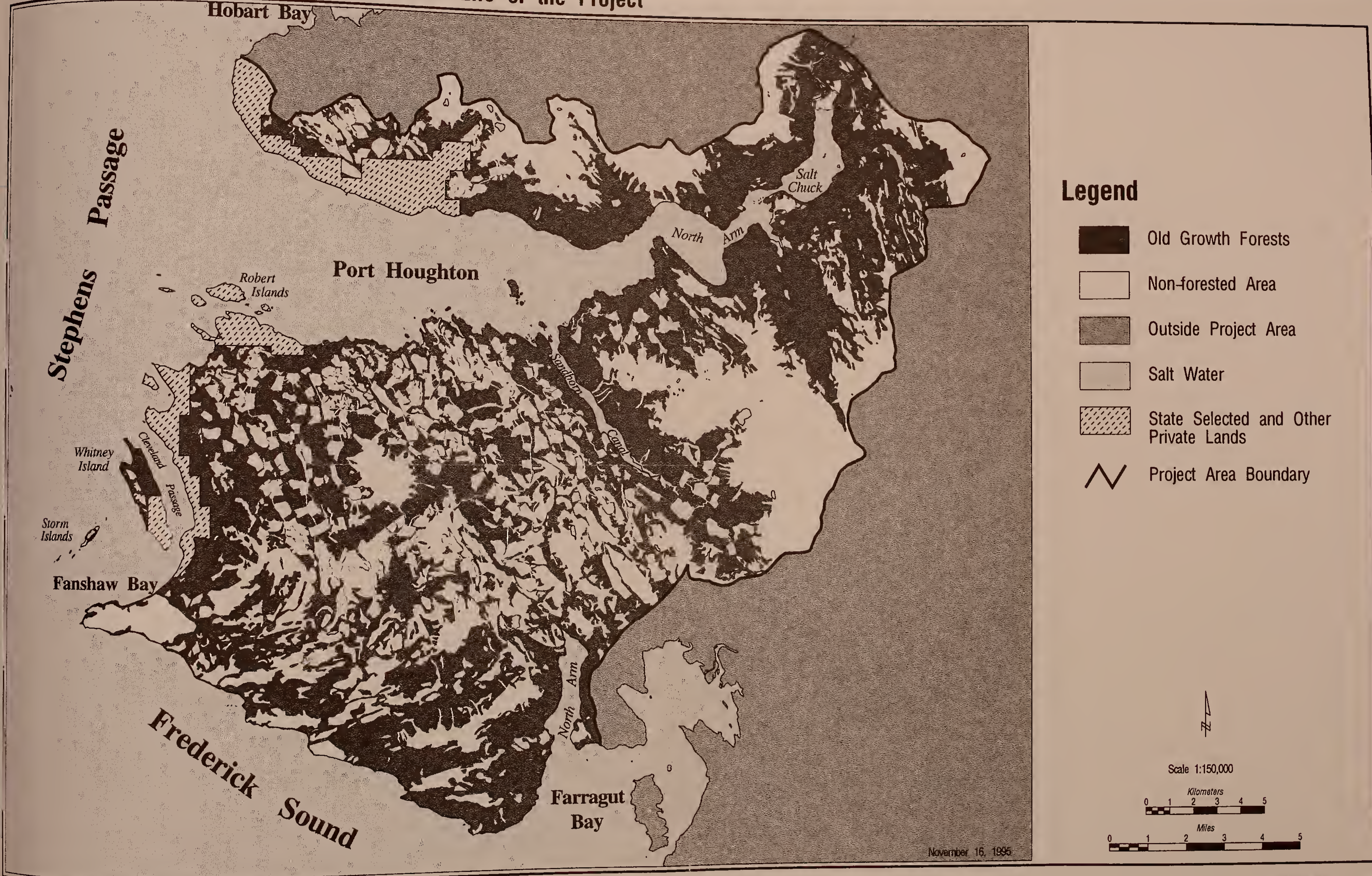
* These acres are identified in USDA-FS (1986).
Source: Gunther 1995c

Figure 4-2 illustrates all old-growth forested areas that would be preserved as retention areas throughout the life of the project regardless of the alternative selected, and reflect the minimum amount of old growth retention.

The following are general area descriptions of important wildlife areas.

- **North Shore between Triplett Lakes and North Arm.** This area has suitable mountain goat habitat, and provides an east/west travel corridor for mountain goats and old-growth-dependent species on the north shore of Port Houghton, which is otherwise limited due to the mountainous habitat directly north of this area. The area contains old-growth forest, and

Figure 4-2
Old-Growth Habitat to be Maintained for the Life of the Project



alpine and scrub habitats. No harvest is planned on the North Shore between Salt Chuck and land areas south and east of Edith Peak.

- **Salt Chuck and Rusty River and Glen Creek Drainages.** Old-growth forests primarily surround these areas. Important anadromous fisheries occur in the Rusty River and Glen Creek drainages. A large, diverse and unique estuary is associated with the Salt Chuck. The saltwater is important foraging habitat for marbled murrelets, arctic terns (including nesting areas), shorebirds, waterbirds, Steller's sea lion, harbor seals, and other marine animals. The terrestrial portion provides undisturbed habitat and travel corridors for northern goshawks, wolves, bear, marten, hairy woodpecker, brown creeper and other old-growth-dependent species. No harvest is planned north, east, or south of these areas.

- **East Slope of Sandborn Canal.** This area is principally an important wildlife travel corridor between the east and west portions of the south shore of Port Houghton. Travel is otherwise limited due to the extensive mountainous terrain south and east of this area. The forest may be important to nesting marbled murrelets as it is adjacent to the Sandborn Canal, which is known to provide good foraging habitat for these birds. No harvest is planned along the eastern shore of Sandborn Canal except for one unit (Unit 341118) (30) located near the Rabbit Cove LTF.

- **Dahlgren Peak.** This area is important for mountain goat use and other wildlife dependent on alpine habitat. No harvest is planned in the alpine, brush, and some adjacent old-growth habitat in this area.

- **Fanshaw Range.** Excellent old-growth habitat occurs in the northern portion of this area, and large amounts of unfragmented muskeg occur in the southern portion. This area is an important wildlife travel corridor on the west shoreline of the project area. State-selected lands now occupy the shoreline areas. Wildlife species that would benefit from no harvesting in this area include northern goshawk, marbled murrelet, hairy woodpeckers, bear, and marten. No harvest is planned in this area.

- **Farragut Bay North Arm and South Fanshaw.** This area surrounds an important estuary and includes high-quality alpine and old-growth habitat surrounding the saltwater. The area serves as an important travel corridor to areas both east and south.

Cumulative Effects

Cumulative effects resulting from implementation of a Port Houghton/Cape Fanshaw action alternative and other management activities through the year 2010 were examined. Previous timber harvest has occurred on Goldbelt, Inc. lands located along the northwest shore of Port Houghton. These harvests have likely resulted in local reductions of many old-growth dependent wildlife populations.

On Goldbelt, Inc. lands, sedimentation in streams resulting from harvest activities may also have altered fish habitat and use. However, for this analysis, it was assumed that no past timber harvest in the project area occurred that has significantly affected the biodiversity conditions in unharvested potions of the project area. This assumption is justified because the north shore of Port Houghton is relatively isolated from the Cape Fanshaw areas by Port Houghton and by mountains, cliffs and steep slopes that occur along the perimeter of Port Houghton.

The Forest Service has no planned harvest in the project area beyond that considered in the action alternatives discussed in this EIS up to the year 2010. There may be at least two more entries in this project area before the end of the timber rotation. However, there is no firm schedule for these entries and they are not expected to occur before 2010. Since no future projects are planned in the project area through the year 2010, cumulative effects to biodiversity are not anticipated at this time.

Threatened, Endangered, Candidate and Sensitive Species (Issue 5)

The only threatened and endangered land-based wildlife species potentially occurring in the project area is the American peregrine falcon. The humpback whale and stellar sea lion are endangered and threatened species, respectively that occur in marine waters adjacent to the project area. The perigrine falcon has not been seen nor is it likely to occur within the project area. Candidate terrestrial wildlife species include North American lynx, harlequin duck, northern goshawk, marbled murrelet, olive-sided flycatcher, spotted frog, and Alexander Archipelago wolf. USDA-FS sensitive species include the trumpeter swan, northern goshawk, and osprey.

Direct and Indirect Effects

Plants

There is only one known occurrence of a TES species in the project area. This plant is a Forest Service sensitive plant, *Poa laxiflora*, known to occur in estuarine wetlands along the Sandborn Canal (Kelley 1995c). No timber harvest activities or project impacts are proposed in this estuary, or within the 1,000-ft buffer of this estuary. No other impacts would occur to TES plant species as no other species were observed to occur in the project area in the vicinity of units or roads. No indirect or cumulative effects are expected to result to TES plants.

Fish

No threatened, endangered, or candidate fish species occur in the project area, and no effects to these species are projected.

Wildlife

Peregrine Falcon - Because peregrine falcons are not known to nest within the project area, the proposed timber harvest would not have any effect on this species. If the species were to occur in the project area in the future, coastal cliff areas (where this species is likely to nest) are protected within beach fringe areas, and alpine habitat (where this species may also nest) is not proposed for harvest.

Spotted Frog - Spotted frogs were not observed or expected to occur in the project area. No effects to the spotted frog are projected to occur from the proposed timber harvest.

Trumpeter Swan - Trumpeter swan may use estuaries and lakes in the project area. No timber harvest is planned in these habitats; thus, impacts to this species would not occur under any action alternative. However, since trumpeter swans are solitary species that prefer isolated areas, they may be adversely affected by timber harvest and air traffic.

Harlequin Duck - Although harlequin ducks have only been observed in saltwater areas within Port Houghton, they could potentially breed in the project area. Timber harvest typically affects harlequin ducks through loss of nesting habitat or through sedimentation impacts in rapidly flowing streams where they forage. They breed in tree cavities in proximity to rapidly flowing streams during the summer months. Although no alternatives identify harvest within 100 ft of any Class I or II streams, there is no current information indicating that harlequin ducks nest within 100 ft of Class I and II streams. Thus, harvest beyond 100 ft of streams could affect harlequin duck nesting habitat. Increased sediment loads could also affect feeding habitat.

Alternatives C and D have roads that end approximately one mile south of the mouth of Negro Creek where this species has been observed feeding and loafing. The remaining alternatives do not propose harvest or roads for at least 1.75 miles from the mouth of Negro Creek. The proposed harvest could affect the known feeding and loafing areas where these birds were observed (mouth of Negro Creek) because of increased sediment loads, but the magnitude of this impact is believed to be minor.

Northern Goshawk - *Impacts to the Overall Population* - Timber harvest could affect the goshawk population that breeds and forages in the project area. Three nests are known to occur in the project area and there are four additional locations in the project area where three or more separate goshawk sightings occurred in summer 1994. This suggests the presence of four or more nesting territories. In addition, it should be understood that surveys for goshawks were largely conducted where units or roads are planned.

Timber harvest would reduce old-growth forest by 5,316 to 7,044 acres, for an average of 5,941 acres (the actual acreage would be less because several units are partially cut units - see the *Timber* section). Considering all land in the project area and remaining acres of volume classes 4-7, the harvest would reduce the amount of forest to represent 52 percent of the entire project area. Since the forest that remains is above 50 percent, it is possible that enough old-growth may remain to continue supporting the 10 pairs of goshawks estimated to occur in the project area.

The alternatives that have the highest amount of acreage to be logged (Alternatives B and D) also have a higher proportion of partial harvest units that goshawks could use both for nesting and foraging. Alternatively, the harvest location and the amount of disturbance is a significant contributor of impacts to goshawks. Harvest could impact more goshawks than predicted if, by chance, nests are lost and disturbance causes breeding goshawks to desert nests.

Impacts to Specific Nests - Three goshawk nest sites (Cat Creek, Sandborn Canal, and Negro Creek) have been located in the project area. Active goshawk nests have been considered on a case-by-case basis, with a specific evaluation of the habitat in the environment of each nest. Goshawk nests are generally not reused in Southeast Alaska, although new nests usually occur within 30 acres of previous nests. No harvest units were proposed by any alternative in the nest areas around each of the three nest sites. The nest areas were developed using the closest 30-acres of old-growth forest (volume classes 4-7) surrounding the nest sites (USDA-FS 1994a). Current road layout design includes a road traversing immediately adjacent to the 30-acre nest area. It is possible that this road could be within 30 acres of future goshawk nests.

An interim nest protection zone of up to 300 acres per active nest may be maintained (Recission Bill 1995). Areas outside the nest protection zone have been considered for other management activities consistent with the current TLMP, as amended.

The 1994 draft goshawk guidelines provide that the immediate old-growth forest within 600 acres be used as a Post-Fledging Area. There is sufficient contiguous old-growth forest around each nest that a Post-Fledging Area that extends beyond

the 600-acre core radius that does not include units and roads could be delineated. Table 4-16 lists the roads and units that occur within the 600-acre core radius of the three nests in each alternative.

Table 4-16

Road and Unit Acreage Within a 600-Acre Core Radius of Goshawk Nests*

Nest Site	Alternative B	Alternative C	Alternative D	Alternative E
Cat Creek Nest				
Salvage Area[1]	49.1		49.1	
Unit 27103 (158)			10.5	
Road 6131	0.3	0.3	0.3	0.3
Total	**49.4**	**0.3**	**59.9**	**0.3**
Negro Creek Nest				
Unit 321006[2] (54)		26.9		
Unit 321007 (59)		17.9		
Unit 321008 (53)	8.9			
321 Group			19	
Road 8495	0.1	0.1	0.1	
Total	**9.1**	**44.9**	**19.1**	**0**
Sandborn Nest				
Unit 333086 (111)	1.6	1.6	1.6	1.6
Unit 333087 (89)	0.3		0.3	0.3
Unit 333088 (97)	64.7		64.7	64.7
Unit 333090 (84)				10.8
Unit 333093 (117)	33.3	33.3	33.3	33.3
Unit 341097 (98)[3]				21.1
Road 8494[4]	3.6	3.6	3.6	3.6
Road 849412				0.1
Road 8496	0.1	0.1	0.1	0.1
Total	**103.6**	**38.6**	**103.6**	**135.6**
Total (all nests)	**162.1**	**83.8**	**182.6**	**135.9**

*A 50-ft road width was used to determine road acreage. 600 acre core radius equals 2,885 ft.

[1] Closest unit, about 0.4 (2,112 ft) mile from nest site.

[2] Closest unit, about 0.3 (1,584 ft) mile from nest site.

[3] Closest unit, about 0.1 (528 ft) mile from nest site.

[4] Closest road, about 260 ft from nest site. This road may be moved if alternative nest sites for the goshawk are identified. Two road modifications have been proposed to reduce impacts to any nest in this area (see Figures 2-5, 2-6).

Source: Gunther 1995c

Alternative C has less harvest proposed near goshawk nests than Alternative D which has the most proposed harvest near nests of any other action alternative. Alternative E has the greatest harvest impact on any single nest (Sandborn). Alternative D would affect the Cat Creek nest more than any other action alternative, while Alternative C would affect the Negro Creek nest more than other alternatives. The unit closet to a nest, Unit 333088 (97), is 528 feet from the Sandborn nest. This is closer than the previously proposed guidelines of a minimum distance of 600 feet for a disturbance period greater than three days.

Goshawk Foraging Areas of 6,000 acres have been identified for all nests (USDA-FS 1994a). The foraging areas are not an exclusive 6,000-acre core radius from the nest sites for the Negro Creek and Sandborn nests. Large areas of salt water have been excluded, and other changes to the shape of these foraging areas were based on the location of the nearest old-growth forest where the goshawks would be expected to forage.

In summary, all four action alternatives would have similar effects to the three nest sites. Old-growth habitat within Post-Fledging Areas around known nest sites has been provided by all action alternatives. The overall objective has been to avoid impacts to goshawks in the project area considering the unit and road pool. Since total old-growth forest (volume classes 4-7) would be reduced from representing 56 to 52 percent of the entire project area, and this is a first entry with no cumulative effects for previous logging, effects on the goshawk population are likely to be minor. The two roading modifications in the Sandborn Canal area (Figures 2-5, 2-6) could be implemented to reduce impacts to the future goshawk nest that occurs near the planned roads.

<u>Osprey</u> - Osprey have not been observed in the project area. With the large population of bald eagles inhabiting the shoreline of Port Houghton, it is unlikely that osprey would migrate into the project area in the future. Thus, no impacts are projected.

<u>Marbled Murrelet</u> - Marbled murrelets occur throughout the project area, and differences between the number seen and heard during terrestrial surveys at the varying harvest units could be attributed to differing weather conditions, seasonal timing, or real differences in density. Surveys on saltwater in the vicinity of the project area, indicated a distinct foraging preference by murrelets for Sandborn Canal and Port Houghton Salt Chuck.

Any harvest of old-growth timber, the preferred nesting habitat for marbled murrelets, would have an impact on the local breeding population due to loss of potential nesting habitat. Impacts for this proposed timber harvest have been decreased by minimizing the total harvest to between 6 and 8 percent of the entire project area and avoiding some of the large blocks of high volume old-growth

timber through concentrating harvest location. All proposed harvest alternatives are likely to impact local murrelet populations in the vicinity of the harvest, but overall impacts to the murrelet population in Southeast Alaska would likely be minor. Alternatives B and C probably have the least overall impact based on volume and distribution. Alternative D has the highest volume of old-growth harvest, and Alternative E includes over 1,000 acres of harvest units in the Sandborn River watershed where, presumably, murrelet numbers are high based on water survey data in the Sandborn Canal.

Olive-sided Flycatcher - No olive-sided flycatchers were observed in the project area. Preferred habitat for this species is forested edges. No impacts are projected to occur to this species, if it is present in the project area.

Gray Wolf - Carrying capacity for the Alexander Archipelago gray wolf within each WAA does not change under any of the action alternatives (Table 4-12), although the overall carrying capacity would decrease by 1 wolf for Alternatives B and D (Table 4-17). These results are difficult to interpret because too few wolves inhabit the project area. For a loss of one entire wolf to occur in a WAA, the decrease in habitat capability would need to be 25 percent. Primary wolf prey (deer, mountain goat, and moose) are predicted to have a carrying capacity decrease of 1 to 14 percent, but this decrease is not significant enough to decrease the overall wolf carrying capacity by more than one half of a wolf for any WAA.

Table 4-17

Changes in Wolf Carrying Capacity (Number of Individuals) by Alternative

	Alternative				
	A	B	C	D	E
WAA 1601	5.01	3.60	3.66	3.60	3.65
WAA 2927	3.84	4.87	4.92	4.87	4.91
Total	**8.95**	**8.47**	**8.58**	**8.47**	**8.56**

Source: Gunther 1995c

Timber harvest primarily affects wolf populations by reducing the carrying capacity of its prey species (deer, mountain goats, and moose), and by increasing hunter access through construction. This latter effect results in increased wolf mortality through hunting and vehicular deaths. Human-caused mortality is

believed to be the most important mortality factor for wolves in Alaska (Ballard et al. 1987). The human harvest rate of Southeast Alaska wolves was estimated at 14.6 percent in 1988-89 (Morgan 1990 in Kirchoff 1993b), much of this along logging roads. Road densities proposed in the harvest alternatives range from 0.40 mi/mi^2 (Alternative D) to 0.53 mi/mi^2 (Alternative C); these densities are below the critical threshold of 0.90 mi/mi^2 presented by Kirchoff (1993b) to sustain viable populations. Consequently, while the proposed harvest activities and associated roading could affect wolf mortality and presence in the project area, these activities would probably not preclude wolf use of the area, especially since large tracts of the project area (e.g., Salt Chuck) would remain unroaded. The primary factor that would affect wolves in the project area is whether hunters would use motorized vehicles to hunt the larger mammals.

North American Lynx - No lynx were observed by the project team during field surveys; nor are they unlikely to occur in the project area because their primary prey (snowshoe hares) are also not expected to occur in high enough densities to support lynx, if hares are present at all. Consequently, the proposed timber harvest would not be expected to affect the distribution of this species.

Marine Mammals

Humpback Whale - The operation of LTFs could potentially impact humpback whales through disturbance. Marine mammals generally avoid LTF sites and adjacent areas due to human activity and noise during log transport. Humpback whales generally do not occur in shallow water where LTF sites are located because they require deep water to feed. Disturbances would be limited to boat traffic occurring in known feeding areas such as the mouth of Sandborn Canal.

Steller Sea Lion - Steller sea lions are not known to haul out in significant numbers or breed in the project area. One Steller sea lion was observed swimming by the proposed North Point LTF site during summer 1994. Nearest haulout sites are Sunset and Sail Island. More Stellar sea lions would be expected to occur in the project area in the fall through spring months since they migrate to the outer coast during the summer months to breed. Hoover (1988), in her comprehensive species account on management recommendations for Steller sea lions, did not directly mention activities associated with logging as a conservation issue with this species. Two management issues—disturbance and environmental contamination—have historically arisen with proposed timber harvest activities. Disturbance concerns have focused on impacts to haulouts and rookeries, none of which occur in the project area. More likely, potential disturbance to local Steller sea lion populations in the project area may result from (1) increased boat activity associated with log-transport in Port Houghton, (2) increased boat activity, both

commercial and recreational, associated with logging camp sites, and (3) increased float plane and helicopter activity associated with the logging camp sites. However, these types of disturbance have not been shown to have long-term detrimental impacts on sea lions (Calkins and Pitcher 1982), and the harvest activity would occur when most adults are breeding on the outer coastal islands.

Cumulative Effects

The proposed harvest involves direct effects to candidate species but no direct effects to threatened or endangered species. The candidate species are harlequin duck, marbled murrelet, northern goshawk, and gray wolf. The cumulative impacts are that these species would decline in the project area which also appears to be occurring throughout their range. However, the project area does not represent a large percentage of these species' ranges or populations and does not represent an ecologically essential portion of the species' range. The project area does represent a geographically large planning area and does involve some species with low population numbers or reproductive capacity (northern goshawk and gray wolf). For the northern goshawk, the proposed harvest may create long-term adverse conditions. Indirect cumulative effects could occur to the humpback whale and Steller sea lion through human disturbance in marine waters which is occurring elsewhere through increased tourist, sport fishing, and commercial boating activity.

Fish and Water Resources (Issue 6)

The overall objective of this section is to identify and analyze the effects of timber harvest alternatives on fisheries and water resources in the Port Houghton/Cape Fanshaw project area. The analysis addresses potential changes in hydrology, water quality, sedimentation, and fish passage. Included are comparisons of the relative magnitudes of effects that could occur under proposed timber harvest alternatives. Quantitative analyses were conducted, where possible, to estimate potential impacts to water quality and to assess risks to beneficial uses (primarily fish habitat), goals stated by the Alaska Department of Environmental Conservation in their EIS scoping comments. Analysis of effects on marine resources, including commercial fisheries, are addressed in the *Marine* section of this chapter.

Fisheries and water quality concerns were incorporated in the development of each timber harvest alternative. There are no timber harvest or road construction activities planned for the Rapid River and Glen Creek watersheds that drain into the Salt Chuck at the east end of Port Houghton, in part because of critical anadromous fish habitat in this area. The Sandborn River watershed was also avoided in all but one alternative because of its importance as a highly productive salmon fishery. Throughout the project area, logging and road construction on high stability soil hazard (Class IV) areas was avoided under every alternative. Development of log transfer facilities at the proposed Little Lagoon, North Point,

and Rabbit Cove locations are not expected to have effects on freshwater resources.

Direct and Indirect Effects

Hydrology

Forest practices are known to affect the magnitude and timing of streamflows. Removing vegetation by timber harvesting results in increased runoff to streams by decreasing rainfall interception (i.e., rainfall that lands on plants and is evaporated) and transpiration (i.e., water uptake by plants) (Harr 1989). The reduction in interception and transpiration following logging also results in greater summer soil moisture and a consequent increase in summer low flows, that may benefit fish productivity in some streams. One Southeast Alaska study found significant increases in low flows after a 35 percent clearcut of the Staney Creek watershed (Bartos 1989). Wetter soils can also result in greater peak stream flows during fall rain storms; because less water is lost to infiltration, more is available for runoff.

Generally, the greater the proportion of the watershed that is logged, the greater the increase in annual water yield. There have been few studies of streamflow responses to timber harvest in Southeast Alaska. Meehan et al. (1969) found no significant changes in streamflow after clearcutting 25 percent of the Maybeso Creek watershed near Ketchikan, Alaska. The maximum proportion of any watershed area proposed for logging under any of the timber harvest alternatives is 20 percent in the Walters Island Creek drainage (Watershed 333) under Alternative E (Table 4-18).

The greatest likelihood for causing significant effects through alteration of forest hydrologic processes in the Pacific Northwest is through the influence of timber harvest on snow accumulation and melt during rain-on-snow events (Washington Forest Practices Board [WFPB] 1994). Applicability of these findings to Alaskan conditions is still being evaluated. In the transient snow zone, the range of middle elevations where both snow and rain are common in most years, the rapid melting of snow during warm, windy periods of high rainfall accounts for most high flows (Harr 1981). Winter storm peaks resulting from rain-on-snow in the Jamieson Creek watershed near Vancouver, British Columbia, showed a maximum increase of 13.5 percent following clearcutting of 19 percent of the basin (Golding 1987). The majority of the logging units proposed for the Port Houghton/Cape Fanshaw project area lie in the transient snow zone.

Road construction may also influence the timing and magnitude of peak flows. Compaction of the soil on roads reduces local infiltration, and the road drainage network (i.e., ditches and culverts) increases runoff efficiency. However, research indicates that increases in peak flows are unlikely to be of any consequence except where roads and other areas of compacted soil occupy substantial proportions of small watersheds (Harr 1989). The percentage of any

Table 4-18. Areas and Percentages of Proposed Timber Harvest and Roads Per Watershed for Each Action Alternative

		Alternative B				Alternative C				Alternative D				Alternative E			
	Total watershed	harvest area		road area		harvest area		road area		harvest area		road area		harvest area		road area	
Watershed	area (ac)	(ac)	(%)	(ac)	(%)	(ac)	(%)	(ac)	(%)	(ac)	(%)	(ac)	(%)	(ac)	(%)	(ac)	(%)
261	6,990	140	2	20	0	140	2	20	0	90	1	10	0	140	2	20	0
271	8,670	490	6	40	0	390	4	20	0	520	6	40	0	490	6	40	0
291	12,240	890	7	90	1	960	8	100	1	1,000	8	100	1	930	8	100	1
302	2,030	10	0	0	0	10	0	0	0	10	0	0	0	0	0	0	0
311	4,880	0	0	0	0	490	10	60	1	300	6	0	0	0	0	0	0
312	570	0	0	0	0	0	0	0	0	30	5	0	0	0	0	0	0
321	8,340	960	12	90	1	1,280	15	150	2	870	10	60	1	530	6	40	0
322	4,070	530	13	60	1	390	10	50	1	480	12	60	1	380	9	40	1
331	2,280	400	18	30	1	0	0	10	0	360	16	30	1	340	15	30	1
332	5,020	550	11	80	2	390	8	60	1	540	11	90	2	740	15	90	2
333	3,530	490	14	70	2	220	6	40	1	500	14	70	2	690	20	90	3
341	17,290	90	1	10	0	190	1	30	0	130	1	20	0	960	6	20	0
381	4,830	240	5	20	0	240	5	20	0	310	6	10	0	0	0	0	0
398	8,340	240	3	30	0	590	7	80	1	390	5	20	0	0	0	0	0
Total	89,080	5,030	6	540	1	5,290	6	640	1	5,530	6	510	1	5,200	6	470	1

Source: Good 1995b

watershed occupied by roads is limited to between 0 and 3 percent for any alternative proposed for the Port Houghton/Cape Fanshaw project area (Table 4-18).

Analyses of watershed hydrology in the Port Houghton/Cape Fanshaw project area were directed at estimating the existing frequency and magnitude of flood events on major streams, and determining the likelihood that peak flows would increase as a result of management activities. A procedure developed by the U.S. Geological Survey (Jones and Fahl 1994) was used for estimating flood magnitudes for specific recurrence intervals for ten ungaged streams in the project area. The procedure is based on regional regression analyses of flood frequency information from gaged streams in coastal areas of southern Alaska. The potential for increased peak flows in each watershed was evaluated by examining the total areas of timber harvest units and roads in the rain-on-snow-dominated elevation zone for each action alternative.

Interpreting the effects of changes in peak flows is confounded by the fact that peak flows are naturally highly variable from year to year in response to storm events. Stream channels are adjusted to accommodate the storm events that occur an average of once every two years in lower gradient streams, and once every five years in steeper mountain streams (WFPB 1994). Storms of these magnitudes and larger are the events that mobilize and move bedload in the streams. It is this mobilization and scour of stream bed materials that can result in the disruption of the fish egg incubation environment (i.e., redds). Fish habitat can be significantly affected when either (1) the increase in peak flows from frequent small floods (i.e., two-year frequency) increases the resulting depth of scour, or (2) the flows associated with the 5-year event occur significantly more often (WBFP 1994). Larger storms cause deeper scour of the streambed and would have significant effects on fish broods in the years they occur. However, increases in these less frequent events have a lower probability of affecting the entire population. Generally, increases in peak flows of more than 10 percent may cause adverse effects.

The total areas of timber harvest and roads in the transient snow zone within each watershed were calculated for each action alternative to compare the relative potential for increases in peak flows (Table 4-19). The actual increases in storm flows that would result from these activities cannot be predicted. Those watersheds where more than 10 percent of the area is proposed for logging and roads within the rain-on-snow zone under one or more alternatives include: Robert Islands Creek, West and Middle Forks Negro Creek, East Fork Negro Creek, and Walters Island Creek. The greatest proportion of a watershed proposed for logging and roads in the transient snow zone is 14 percent of the Robert Islands Creek drainage (Watershed 321) under Alternative C. Alternative C is the least likely to result in measurable increases in peak flows in the larger streams of the project area, except Robert Islands Creek.

Table 4-19

Total Timber Harvest and Road Areas Within the Rain-On-Snow Elevation Zone* Per Watershed for Each Action Alternative

		Alternative (acres)			
Watershed	Total Watershed Area (acres)	B	C	D	E
261	6,990	160	160	100	160
271	8,670	520	410	550	520
291	12,240	800	870	920	920
302	2,030	10	10	10	--
311	4,880	--	260	230	--
312	570	--	--	10	--
321	8,340	**910**	**1,190**	780	560
322	4,070	**530**	330	**440**	400
331	2,280	**310**	10	**270**	**250**
332	5,020	490	350	280	480
333	3,530	**360**	110	**360**	**470**
341	17,290	90	200	150	870
381	4,830	240	240	220	--
398	8,340	240	530	300	--
TOTAL	**89,080**	**4,660**	**4,670**	**4,620**	**4,630**

*The elevation zone where peak runoff is dominated by rain-on-snow events was estimated to lie between 500 and 1,700 ft elevation based on observations at the Mitkof Island snow survey station.

Bold values indicate the total timber harvest and road areas within the rain-on-snow elevation zone are greater than 10 percent of the total watershed area.

Source: Good 1995b

Effects of timber harvesting and associated activities on peak flows and other hydrological variables are not expected to cause measurable adverse impacts, thus no mitigation measures have been recommended specifically for hydrological effects. However, revegetation of disturbed areas and erosion control BMPs would reduce the potential for hydrological effects.

Water Quality

Potential water quality effects from forest practices are generally limited to increased vegetative debris, increased sediment and turbidity, increased stream temperatures, and resulting oxygen depletion in streams. Other potential inputs that could affect water quality include fuel, oil and grease spills; effluent from sanitary facilities; and fertilizer from erosion control on forest road cutslopes.

Vegetative Debris - Timber harvest can introduce vegetative debris into streams, particularly along stream reaches with no buffers. ADEC (1990) reported that felling trees into streams is the most common type of incident resulting in issuance of a Notice of Violation by the State of Alaska. In slow-moving water, smaller debris generally settles to the bottom and may become incorporated in substrates, covering or altering habitat. Decomposition of small vegetative debris can cause a reduction in dissolved oxygen, and may cause leaching of organic chemicals, some of which are toxic to aquatic organisms. Large woody debris (e.g., tree trunks and stumps) are essential to dissipating energy from flood flows, stabilizing stream banks, and providing pool and cover habitat for fish. State and federal practices dictate maintaining natural and beneficial quantities of large woody debris in streams.

Because timber harvest would not occur within 100 ft of Class I and Class II streams under any alternatives, the differences between alternatives with respect to introducing vegetative debris to streams are considered negligible. Habitat alterations from the accumulation of small vegetative debris are not expected to occur in fish-bearing waters because these streams generally have sufficient flows to flush debris from substrates.

Stream Temperature and Dissolved Oxygen - The potential for increased stream temperatures and dissolved oxygen depletion in fish-bearing waters is greatest downstream from the following timber harvest units where logging would occur along Class III streams: 26103 (164), 27107 (160), 27108 (163), 27109 (169), 29119 (168), 29121 (172), 29126 (145), 311146 (18), 311147 (17), 321009E (61), 321017 (164), 322037 (94), and 341107 (139). Non-merchantable shade-producing trees and shrubs would be retained along Class III streams within these units. Silvicultural prescriptions for these units that would protect streamside vegetation include combinations of the following practices: split yarding away from Class III streams, full suspension yarding, partial suspension yarding, and directional felling. These measures also avoid getting logging debris into streams and would reduce the potential for dissolved oxygen depletion impacts. Retaining non-merchantable shade-producing trees and shrubs along Class III streams, and implementing the silvicultural prescriptions and BMPs are expected to be successful in preventing adverse impacts to fish from increased stream temperatures or dissolved oxygen depletion.

Sedimentation and Turbidity

Sedimentation occurs naturally in Southeast Alaska, primarily through landslides induced by heavy rainfall on steep slopes with unstable soils (ADEC 1990). Timber harvesting and roads may promote sedimentation in several ways: (1) mass wasting (e.g., landslides) caused by road building; (2) erosion of materials exposed during road construction, use, and maintenance; (3) landslides caused by harvesting timber from steep slopes; (4) erosion of hillslopes disturbed during logging; and (5) disturbance of streambanks and stream channels, including bridge

and culvert crossings. Depending on water velocity, sediment particles smaller than one millimeter generally are carried in suspension and contribute to turbidity (i.e., reduced clarity) of the water. Sediments greater than one millimeter are carried by bedload transport along the stream bottom during high flows.

State of Alaska water quality standards have been established for sediment and turbidity for the protection of beneficial uses, including the growth and propagation of fish, shellfish and other aquatic life. The standards prescribe that the percent accumulation of fine sediment (0.1 to 4.0 mm particle size) in the gravel bed of waters used by anadromous or resident fish for spawning may not be increased more than 5 percent by weight over natural conditions, and in no case may fine sediment in these waters exceed a maximum of 30 percent by weight. Further, turbidity shall not exceed 25 nephelometric turbidity units (NTU) over natural conditions in streams, and shall not exceed 5 NTU over natural conditions in lakes. The ADEC, at its discretion, grants short-term variances from the standards for one time, temporary activities that are nonpoint sources of water pollution.

Increased sedimentation is typically the greatest impact of timber harvest activities on water resources. In addition to water quality degradation, the adverse effects of excessive sediment on aquatic habitat and fish are well documented. Fine sediment can cover streambeds and fill interstitial gravel spaces, reduce interstitial dissolved oxygen, impede fish egg development, reduce fry size, impede fry emergence, cover and hide food sources, reduce plant and invertebrate productivity, slow the growth rates of fish, abrade fish gills, and cause fish avoidance of affected waters (ADEC 1990). High levels of sediment can reduce the size of pools, disrupt spawning areas, and cause hydrologic changes. Debris torrents from landslides can cause scouring of stream channels and destruction of fish habitat.

<u>Road Erosion Sediment Yield</u> - Erosion from roads is often the most significant contributor of fine-grained sediments to streams. Unlike surface erosion from exposed hillslopes where revegetation usually occurs within a few years, road surfaces can continue to produce fine sediments over the life of the road, especially when used by log trucks (WFPB 1994). However, truck traffic in the project area would be limited after the timber harvesting has been completed. The amount of sediment produced from the driving surface of a forest road is determined by the amount and type of traffic, construction materials and methods, and the design of the drainage system.

The estimated increases in sediment yield resulting from roads under each action alternative are evaluated by comparing road sediment yield to background sediment yield by watershed (Table 4-20). Assumptions used in applying this model to the Port Houghton/Cape Fanshaw project area were based on conditions expected during active timber harvesting in the first years after road construction,

Table 4-20. Estimated increases in sediment yield resulting from roads for each action alternative[1]

Watershed	Alternative B Sediment yield increase (%) over background yield[2]	Alternative C Sediment yield increase (%) over background yield	Alternative D Sediment yield increase (%) over background yield	Alternative E Sediment yield increase (%) over background yield
261	12	8	3	15
271	20	6	25	25
291	32	16	25	51
311	0	14	0	0
321	11	23	12	2
322	25	68	33	14
331	107	99	89	14
332	55	59	39	47
333	21	10	31	39
341	0	1	1	53
381	10	8	2	0
398	10	24	0	0
Total[3]	18	19	15	27

[1] These estimates are useful for identifying watersheds where sediment yield increases may be greatest and comparing the relative potentials for sedimentation impacts between alternatives on specific watersheds. Actual sediment yields may vary widely.

[2] Average sediment increase (%) from roads for each action alternative is calculated as the total road sediment yield (T/yr) for all watersheds divided by the total background sediment yield (T/yr) for all watersheds times 100.

[3] Based on total road sediment yield for each alternative (B is 2,462 T/yr, C is 2,585 T/yr, D is 2,027 T/yr, and E is 3,645 T/yr) divided by 13,490 T/yr which represents background sediment yield.

Source: Good 1995b

the period when sediment yield is greatest. These estimates also assume logging will be limited to a six-month season during the drier part of the year, at least 6 inches of competent rock will be used for surfacing on roads west of Sandborn Canal, and required erosion control "best management practices" (BMPs) will be implemented. Authors of this procedure recommend that analysts interpret results with caution because this is a crude sediment budget technique based on limited field observations. Table 4-20 estimates are useful for identifying where impacts are expected to be greatest and comparing relative impacts between alternatives on specific watersheds.

Where increases in sediment yield exceed 100 percent, the change could be large enough to indicate that water quality standards may be exceeded. If sediment is increased by 50 to 100 percent, the effect may be small but detectable. No increases of greater than 100 percent were estimated to result from road erosion in project area watersheds (Table 4-20), with one exception (107 percent increase in Watershed 331 under Alternative B). This exception is due to use of the main haul route in watershed 331 for transporting timber between units west of this watershed to the Little Lagoon LTF. Increases in sediment yield greater than 50 percent are predicted for some watersheds during the first years following disturbance. However, chronic water quality and sedimentation affects are not expected since further reductions in sediment yield would be achieved in subsequent years as roads are closed, traffic is reduced, and revegetation continues. Most of the differences between alternatives may be attributed to the different transportation plans, and the extent of main timber haul roads in each watershed.

Perhaps the most controllable factor that contributes to sedimentation is the amount of truck traffic on roads during the wet season. Although rainfall occurs throughout the year in Southeast Alaska, rainfall in May through July is typically less than in other months of the year. Inactivating the roads for six months per year (November to April) greatly reduces the highest road erosion rates and sediment yields. Road erosion can be further reduced if logging did not occur in October, typically the wettest month of the year. Where road tread degradation is likely to occur due to incompetent surfacing rock, special mitigation measures may be necessary. One measure may be to require use of low tire pressure on log and rock trucks.

BMPs would be implemented along all roads to increase the ground cover density on cutslopes and fillslopes thereby reducing erosion. These measures are assumed to achieve a ground cover density of 20 percent on cutslopes and 50 percent on fill slopes. Where road cutslopes encounter thick glacial till soils that are difficult to revegetate, structural or biotechnical slope stabilization may be effectively used to limit erosion (Gray and Leiser 1982).

In addition to practices designed to minimize road erosion and mass wasting, sedimentation can be reduced by limiting the delivery of eroded sediment to

streams. Sediment yield predictions (Table 4-20) assumed 100 percent of eroded sediment will be delivered to stream channels from 190 ft of road on either side of each stream crossing, based on a typical cross drain spacing. Installing additional cross drains near stream crossings, with outlets directed to filter areas rather than flowing directly into streams, would substantially reduce sediment yield from roads. Once logging is completed in a watershed, temporary roads are closed, revegetation of cutslopes and fill slopes are complete, annual sediment yields from roads are not expected to result in detectable impacts to water quality and fisheries.

Hillslope Erosion - Although road erosion has the greatest potential to generate increases in fine sediment loading to streams, sediment may also originate from hillslope erosion and mass wasting (e.g., landslides). The potential for surface erosion from hillslopes is primarily a function of soil characteristics, the steepness of the terrain, and the vegetation cover (WFPB 1994). Soils on steep slopes that are comprised of easily detached material are the most likely to erode when compacted, or exposed by vegetation removal during logging. However, erosion problems from improperly conducted logging practices can occur anywhere on the landscape. Erosion from land surfaces disturbed by yarding and other activities can be a major short-term source of sedimentation (ADEC 1990).

The relative potential for hillslope erosion impacts in project area watersheds was evaluated for each action alternative by examining the areas of timber harvest proposed in areas with high potential erosion class soils. Soils in the high potential erosion class were so designated based on their soil erodibility factor and slope steepness. No more than 11 percent of any watershed is proposed for timber harvest on high potential erosion soils under any alternative. The four timber harvest alternatives are virtually equal in terms of the total area of high potential erosion class soils (Class III) proposed for logging throughout the project area.

In addition to mitigation measures for road erosion, the Aquatic Habitat Management Handbook recommends BMPs for timber management that address hillslope erosion. These BMPs include timber sale contract provisions for erosion control, use of yarding systems that minimize ground disturbance (e.g., helicopter and skyline systems) in sensitive areas. Implementation of these BMPs and revegetation of disturbed areas are expected to be successful in preventing significant adverse impacts to water resources and fisheries from hillslope erosion under all of the proposed alternatives.

Mass Wasting - Mass wasting is a natural watershed process that may be accelerated by forest management activities. Shallow-rapid landslides and debris flows are two naturally occurring forms of mass wasting in the Port Houghton/Cape Fanshaw project area that affect water resources. Landslides that reach streams can introduce large volumes of soil, rock and debris. In some

cases, a debris flow results, carrying large amounts of sediment and debris downstream and scouring stream channels and streambanks along the way.

Shallow-rapid landslides commonly occur on steep slopes where soil overlies a more cohesive material, such as bedrock. Susceptibility of an area to landslides is affected by steepness of slope, saturation of soil, and loss of root strength (WFPB 1994). Increased soil moisture and reduced root strength from logging potentially increase the occurrence of landslides. Road construction can also increase landslide frequency by oversteepening cutslopes, adding weight to high stability hazard slopes, and concentrating and directing runoff to these slopes. One evaluation of landslides in Southeast Alaska found that the frequency of landslide occurrence per unit area increased five-fold in logged areas compared to unlogged areas (Swanston 1989). However, most of the increase is small slides that do not reach active streams (ADEC 1990). Much of the eroded material from landslides is stored on slopes, with the remainder entering steep V-notch channels for a period of time before reaching fish-bearing streams and valley bottoms (Swanston and Marion 1991).

Debris flows triggered by landslides or road washouts tend to deposit large volumes of sediment and debris in lower gradient, fish-bearing streams. Sedimentation and damage to fish habitat can extend several miles below the point of initiation. Where landslides and debris flows are deposited in narrow valley floors, temporary dams are often created that eventually result in dam-break floods (WFPB 1990). These extreme floods can be many times greater in peak flow than normal runoff floods and can cause extensive erosion of valley walls and channel sedimentation.

The potential for mass wasting impacts to water resources was evaluated by comparing the area of timber harvest and road miles on Soil Hazard Class III and Class IV slopes between alternatives by watershed. The occurrence of mass wasting could significantly increase from timber harvesting or road construction on Class IV slopes; however, all alternatives avoid these activities in Class IV areas. The probability of mass wasting is less for Class III areas, and very little risk of increased mass wasting is associated with Class I or II areas.

Timber harvest alternatives do not vary greatly in the total amount of harvest and roads proposed for moderate stability hazard Class III areas; however, the distributions among watersheds are very different. Most notably, the probability of increased mass wasting occurrence in the Sandborn Canal watershed is substantially greater under Alternative E than any other alternative. Alternative C has the greatest amount of logging and roads proposed for Class III areas in Watersheds 311 and 398, but has relatively little proposed in Watersheds 331 (East Fork Negro Creek) and 333 (Walters Island Creek). Alternative E does not include timber harvest activities in Watersheds 311, 381, and 398, and has less

activity proposed for Class III slopes in Watershed 322 compared to Alternatives C and D.

The primary mitigation for the increased risks of mass wasting is to avoid unstable slopes, particularly Class IV slope stability hazard areas. Additional BMPs to minimize mass wasting include designing roads with balanced cuts and fills to reduce the amount of excavation and size of fills in unstable areas, full bench construction to minimize cutslopes, end hauling of excavation material to minimize fills, control of blasting operations in landslide areas, designing drainage facilities to direct concentrated flows away from unstable slopes, minimizing clearing widths, and revegetating slopes as soon as possible.

Other Sources of Sedimentation - Construction of road stream crossings often creates temporary sedimentation that is dissipated in a matter of hours (ADEC 1990). Road crossing construction impacts in any one watershed are proportional to the number of road crossings proposed under each timber harvest alternative. However, the potential for significant impacts to water resources and fisheries is negligible under any alternative compared to other sources of sedimentation, particularly if BMPs for erosion control and control of in-channel operations are implemented.

Road washouts at stream crossings can occur during flood events where culverts are undersized or improperly constructed. Road materials from a washout, together with water and sediment dammed behind the road, can cause significant downstream channel erosion and sedimentation. Road washouts can be avoided by properly designing crossing structures. Washouts are not likely to occur under any of the proposed alternatives.

Destabilization of streambanks resulting from harvesting trees up to the banks can be a major long-term source of erosion and sedimentation (ADEC 1990). Destabilization occurs when the living root structures that bind bank materials together decay after trees are cut. Accelerated streambank erosion may continue until new trees mature in the streambank areas. Streambank erosion resulting from harvesting trees up to the banks is not expected to be a significant contributor of sediment to streams under any of the alternatives. Streamside logging would only occur along Class III tributaries. Most of these headwater streams in the project area are small volume creeks that flow in confined, high-gradient channels that are not subject to extensive bank erosion.

Other Water Quality Impacts

Short-term impacts to water quality from petroleum product spills, fertilizers, or sanitary effluent are possible under any of the action alternatives during timber harvesting. Petroleum products may enter streams during equipment refueling, storage spills, or vehicle accidents. Seeding and fertilizing road cutslopes and fill slopes may allow fertilizer to enter streams. Sanitation facilities for forest

workers can result in increased nutrient loading to streams. If not properly maintained, sanitation facilities can present a risk to human health from pathogenic bacteria. Under normal operating conditions, water quality impacts from petroleum spills, fertilizer and sanitary effluent are expected to be minimal, and water quality standards would not be exceeded.

The amount of activity proposed in different watersheds dictates the differences between alternatives in their potential for these other water quality impacts to occur. For example, Alternative E is the only alternative that proposes timber harvesting and roads in the Sandborn River watershed; thus, it is the only alternative with the potential for petroleum product spills in that stream. Table 4-18 indicates watersheds where no timber harvest or roads are proposed under each action alternative.

Specific BMPs are recommended to protect against contamination of surface waters from spills of petroleum products and other hazardous substances and to properly manage sanitary facilities. Implementation of these BMPs is expected to prevent contamination of surface water resources from spills or sanitary facilities.

Fish Passage

Roads have the potential to impact fish populations by blocking passage at stream crossings. Tongass National Forest Draft Standards and Guidelines (USDA-FS 1991) state that opportunities for adult and juvenile fish migration must be maintained or improved for Class I streams and Class II streams that flow directly into Class I streams. Culverts are typically used for road crossings of smaller streams, and bridges or bottomless arch culverts are used for larger streams and rivers. If not properly designed and maintained, stream crossing structures can clog with logs and debris, be perched above the stream at the downstream end, or constrict the stream causing high water velocities. These conditions can limit fish migration through the structure and reduce the availability of upstream habitat.

The total number of Class I and II stream crossings proposed in the project area was compared between alternatives as an indicator of the relative potential for fish passage impediments. Alternatives B, C and D are very similar in total Class I and II stream crossings (31 to 34), Class I crossings (7 to 9), and the distribution of crossings among important salmon-producing watersheds. Alternative E has more total Class I and II stream crossings (38) and more Class I crossings (11) than Alternatives B, C and D. Alternative E includes 10 stream crossings of the Sandborn River and its tributaries that are not part of the other alternatives, including two crossings at Class I reaches. Alternative E is also distinguished by having no roads crossing streams in Watersheds 311, 321, 381, and 398.

The proper use and design of culverts and bridges would effectively mitigate any potential fish passage problems at road/stream crossings. The USDA-FS Aquatic

Habitat Management Handbook contains prescriptions for fish passage at Class I and II stream crossings, and the Soil and Water Conservation Handbook BMPs specify additional criteria for the design and installation of bridges and culverts. If culverts and bridges are constructed according to these criteria, then fish passage at road/stream crossings should not be impaired.

Cumulative Effects

Disturbances within a watershed from timber harvest units and roads can be individually small, but may collectively result in larger basin-wide disturbances, or cumulative effects. In some watersheds cumulative effects may potentially lead to increased erosion, changes in hydrology, and reduction in aquatic habitat capability. With the exception of Goldbelt Inc. lands on the north side of Port Houghton, the timber harvesting and roads proposed under the alternatives described in this report would be the first significant management activities in the project area. All Goldbelt Inc. lands within the project area (Figure 1-2) would be logged by 1997.

Cumulative effects in project area watersheds were examined through the year 2010. The Port Houghton/Cape Fanshaw timber sale is likely to occur over a period of several years and be completed by 2010. The only watersheds where cumulative effects may potentially occur from multiple timber sales during this period are Watersheds 311 and 381, where the lower watersheds include Goldbelt, Inc. lands. Future timber harvest activities beyond the year 2010, if any, may have the potential for additional cumulative effects in the project area.

Forest-wide draft standards and guidelines (USDA-FS 1991) establish a threshold for large-scale ground-disturbing activities (e.g., timber harvesting) and associated roading to minimize cumulative watershed effects (CWE) which could adversely affect soil and water resources and result in changes in stream channel equilibrium. The threshold is no more than 35 percent of the acres of a third-order or larger watershed in less than a 15-year period, unless a CWE analysis during project planning indicates otherwise. Goldbelt Inc. lands occupy approximately 15 percent of Watershed 381. The additional logging of 5 to 6 percent of the drainage area proposed under Alternatives B, C and D is not expected to result in significant cumulative effects. In Watershed 311, approximately 30 percent of the drainage area for the unnamed third-order stream would be logged under Alternative C, including a small area that is on Goldbelt, Inc. land. In summary, the CWE threshold would not be exceeded in any project area watershed under the proposed alternatives.

Physical Resources (Issue 7)

Direct and Indirect Effects

Geology and Minerals

Access to existing mining claim areas would be unaltered excepting one claim known as the Port Houghton Stone Producer. No logging is planned at or near the remaining other mining claim areas in the project area.

Port Houghton Copper and Louis Group Mineral Prospects - Activity of these prospects is unknown. No timber harvest activities for any action alternative are planned to occur in the vicinity of these prospects.

Islander Mineral Prospect and Former Trap Line #1 & #2 Lode Claims - The Islander mineral prospect and the Trap Line #1 and #2 lode claims occur on Alaska state-selected land. No timber harvest activities for any action alternative are planned in these areas.

Port Houghton Stone Producer - This claim occurs in the vicinity of Unit 341118 (30) and roads 84934 and 84935. These areas would be harvested under action alternatives B and C. Impacts would include increased access to the producer site, and potential exposure of the resource during timber harvest. No loss of the resource would occur as no roads are planned for construction in the area designated for Sealaska subsurface mining rights. Sealaska Corporation previously operated this site; however, U.S. Bureau of Mines (USBOM) records do not indicate the type of stone, the amount of production, or the time period that the stone operation was active. The site is listed as a past producer.

Former Hecla Mining and Davidson Lode Claims - These claims, which occur in areas distant from timber harvest or road construction for any action alternative, would not be affected by the proposed timber harvest.

Exploration Activity

Timber harvesting activities would provide access to undeveloped areas for exploration activity. However, according to the USBOM, the mineral potential of the project area is low. The USBLM and Alaska Division of Geological and Geophysical Surveys have not evaluated the mineral potential of the project area.

U.S. mining laws confer a statutory right to enter public lands to search for minerals. Access to mining claims would not be prevented by road management planning. Permits by the Forest Service are required for mineral exploration, mining, and prospecting. Road restrictions and entry into limited access areas typically require permits.

Exploration activity for undiscovered mineral resources, leasable minerals, salable and common variety minerals in the project area may increase because timber harvesting and road construction would provide access to less developed or undeveloped areas. If this occurs, exploration activity would provide more specific information on the local geologic units and associated type of mineral deposits that occur in the project area.

Cave Resources

No cave resources were observed or are known to occur in the project area, and consequently, no impacts would occur to cave resources.

Soils

Soil Productivity - Soil disturbance can occur from both natural and man-made causes. Natural causes include surface erosion and mass wasting that occurs through natural soil exposure and weather conditions. Man-made causes include road and landing construction, borrow source/rock quarry development, yarding disturbance, and log skid trails. Erosion is the transport of individual particles (surface erosion), or masses of soil and rock (mass wasting) by gravity, water, or a combination of both. Erosion and mass wasting are part of a natural, ongoing process resulting from tectonic events of the region. The tectonic events cause uplift of the geologic units resulting in over-steepened slopes consisting of parent bedrock with a soil cover. Over time the soil material is transported downward by gravity to surface drainage systems where the material is deposited and reworked.

Timber harvest and road construction create soil disturbances that add to soil erosion already occurring naturally. Maintaining organic-rich topsoil layers is critical for long-term forest site productivity. Timber management activities influence soil productivity and soil nutrient content. The topsoil layer can be impacted by natural forces such as mass wasting and surface erosion, and man-made activities of severe yarding disturbance, road construction, and logging operations. These activities adversely impact soil productivity by changes in surface runoff drainage patterns, soil saturation, soil compaction, soil permeability, and aeration.

Generally, the more acres harvested and roads constructed, the greater the potential for soil disturbance and compaction or displacement. Logging systems also affect the amount of disturbance. The least amount of soil disturbance occurs when helicopter logging is implemented, and the greatest amount of soil disturbance occurs when high lead logging systems are implemented (Table 4-21). Skyline and high-lead logging methods used in Southeast Alaska require logs to be transported or yarded to transfer areas with suspension cables connected to towers. Depending on topography, the logs can be fully or partially suspended above the ground surface. If logs contact the ground surface, vegetation and soil disturbance can occur, causing direct impact by surface erosion and potential mass wasting. For the Port Houghton/Cape Fanshaw action alternatives, Alternative C has the greatest amount of soil disturbance because no helicopter yarding is planned, while Alternative D has the least amount of soil disturbance because this alternative has the greatest amount of helicopter yarding planned. However, the soil disturbance differences among action alternatives are less than 10 percent, and the proportion of soil disturbance compared to total area harvested is between 4 and 6 percent.

Table 4-21

Acres of Soil Disturbance in Harvest Units by Alternative

Logging System	Percent Disturbance Associated with Logging System[1]	Alternatives				
		A	B	C	D	E
Gravity Return	6	0	29	36	23	30
Helicopter	1	0	11	0	29	0
Running Skyline	6	0	67	77	67	76
Slackline	6	0	88	93	77	98
Small Slackline	6	0	90	105	71	104
Shovel	8	0	5	6	6	5
Highlead	12	0	2	2	3	2
TOTAL		**0**	**292**	**319**	**276**	**315**
Total Acres Harvested		**0**	**5,771**	**5,259**	**6,970**	**5,187**
Soil Disturbance as % of Total Harvest		**0**	**5**	**6**	**4**	**6**

[1] Soil disturbance estimates are based on Landwehr (1992) and U.S. Forest Service (1993c) where (1) helicopter yarding systems result is minimal (1%) soil exposure, regardless of silvicultural system; (2) soil exposure with cable yarding and all silvicultural system results in 6% of the soil surface displaced or exposed within units; (3) shovel yarding system results in an acreage of 8% of the soil surface displaced within harvest units; and (4) the highlead system results in 12% soil disturbance. Uncut inclusions within units would be uncut with no soil disturbance.

Source: Morton 1995b

Soil Erosion - Although both timber harvest and road construction activities disturb soils, road construction is the most significant cause of soil erosion and mass wasting. Roads commonly cut across slopes, with the uphill portion of the road cut being steeper than the natural slope (e.g., angle of repose). Depending on the method of road construction, soils and rock removed during construction are commonly placed on the downhill side of the road. This method causes over-steepening, increases the soil surcharge on the downhill slope, and exposes soils on the slope and roadway alignment. Road and quarry soil disturbance expected from the action alternatives show that more disturbance would occur in Alternative C and that this amount is 14 percent greater than Alternative D which has the least amount of soil disturbance (Table 4-22). Again, these differences are due to the number of units planned for helicopter logging which decrease the amount of road required.

Table 4-22
Soil Disturbance Acreage from Road and Quarry Development*

Alternative	A	B	C	D	E
Road Disturbance	0	533.6	663.4	507.1	567.3
Quarry Disturbance	0	66.7	82.9	63.4	70.9
TOTAL	**0**	**600.3**	**746.3**	**570.5**	**638.2**

* Each mile of road displaces approximately 50 ft^3 of existing soils for both temporary and specified roads. Rock quarries disturb 1.5 acres of lands for every 2 miles of road.
Source: Morton 1995b

Cold temperatures may affect plant growth and, even under the best of conditions, tree growth on cold soils can be very slow. However, regeneration occurs rather quickly on disturbed sites in Southeast Alaska. Most of the conifers that grow in this area have shallow, or very shallow rooting systems, and are susceptible to blow down, especially if the timber stand is located in an open area. The shallow rooting habits of trees may be due to lack of adequate soil thickness, shallow depth of bedrock, or availability of moisture and nutrients in the surface soil layer.

Removing trees during timber harvest can cause indirect adverse impacts. Both clearcut and selective logging operations expose the adjacent remaining trees to wind-storm events. Trees in adjacent areas can be toppled with the tree root system intact, exposing underlying soils to erosion and increasing the erosion rate (Harris 1989).

Mass Wasting - Outside of V-notch disturbance, human-induced landslides and mass wasting generally occur in areas of very high mass movement indices (identified in the Port Houghton/Cape Fanshaw project area as Hazard Class IV), and with a less frequent probability in areas of Hazard Class III soils. Six percent of the project area is identified as Hazard Class IV. No roads or units are planned in these areas; however, some planned units and roads are adjacent to these areas which are frequently rated as Hazard Class III. Tables 4-23 and 4-24 provide the amount of soils in each hazard class for units and roads, respectively. Alternative E has the greatest amount of harvest units in Hazard Class III, whereas Alternative C has the fewest harvest units in Hazard Class III, and is 17 percent less than Alternative E. For roads, Alternative C has the greatest miles of road in Hazard Class III which is 4 miles more than Alternative D which has the lowest amount of Hazardous Class III soils. The primary reason that Alternative D has less Hazardous Class III soils is that fewer roads and more helicopter units are planned for this alternative. Note that the relative percentages of Hazardous Class III soils for the action alternatives are similar, ranging from 18 to 20 percent.

Table 4-23

Amount of Harvest Acreage by Alternative Planned in Units by Soil Hazard Class

Soil Hazard Class	A	B	C	D	E
I	0	277	633	491	0
II	0	3724	3039	4786	3272
III	0	1770	1587	1699	1914
IV	0	0	0	0	0
Total	0	5771	5259	6970	5187

Source: Morton 1995b

Table 4-24

Miles of Road Construction Planned for Alternatives by Soil Hazard Class

Soil Hazard Class	A	B	C	D	E
I	0	5.2	14.6	0.7	0.1
II	0	67.9	76.3	68.7	75.9
III	0	15.8	19.7	15.1	18.9
IV	0	0	0	0	0
Total	0	88.9	110.6	84.5	94.5
Percent of total in Hazard Class III Soils	0	18	18	18	20
Acres of Hazard Class III Soils	0	95.7	119.4	91.5	114.5

Source: Morton 1995b

The long-term impact of timber harvest affects areas of steeper slopes. An increase in mass wasting events commonly occurs in Southeast Alaska, three to seven years following logging operations, apparently caused by the decomposition of tree roots and eventual loss of soil support (Swanston 1969). Mass wasting caused by loss of soil support is significantly higher on steeper slopes with relatively shallow soils over bedrock. Steep slopes were avoided for road construction to the extent possible (Table 4-25), with Alternative C having the most areas with sideslopes of 60 percent or greater representing 2 percent of the total miles of roads planned. Alternative C also has the greatest amount of harvest units with 70 percent or greater slopes (Table 4-25), and is 21 percent greater than Alternative B. This latter alternative has fewer acres on steep slopes than other action alternatives. The frequency of landslide occurrence in the area is difficult to predict; however, areas with a high potential for landslide occurrence were evaluated in the planning process; timber harvest was deferred in many of these areas during unit design, or these areas were designated for partial cutting.

Table 4-25

Roads and Timber Harvest Areas Located on Steep Slopes

Alternative	Road Miles with 60% or Greater Sideslopes	Percentage of Total Road Miles on Steep Slopes	Unit Acreage on 70% or Greater Slopes
A	0	0	0
B	1.1	1	65.6
C	2.7	2	82.3
D	0.8	1	72.5
E	0.8	1	72.7

Morton 1995b

Wetlands

Road construction and timber harvest would affect wetlands in the Port Houghton/Cape Fanshaw project area. The large percentage of the project area that is wetland (over 30 percent) and the wide distribution of wetlands throughout the project area make this resource impossible to avoid. A large percentage of commercial forest land area in the project area (up to 20 percent) is wetland, and this area represents an important component of available timber.

The filling and disturbance of wetlands due to road construction (Table 4-26) is similar for each alternative. The amount of road construction within wetlands ranges from about 23 to 31 miles, impacting 143 to 191 acres of wetland, although the impact is less than 0.4 percent of all wetlands in the project area. For each alternative, the greatest amount of wetlands impacted by roads is typically in bogs, fens, and peatlands where up to 14 acres of wetlands are filled. No freshwater lakes or estuary wetlands would be filled for road construction, but up to about 3 acres of subalpine wetlands would be filled for road construction.

Table 4-26

Summary of Wetland Impacts Due to Road Construction, by Project Alternative, for the Port Houghton/Cape Fanshaw Project Area

	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E	
Wetland Type	Miles	Area	Miles	Area	Miles	Area	Miles	·Area	Miles	Area
Coniferous Forested	0	0	6.4	39	9.6	58	3.1	19	2.8	17
Mixed Forest/Bogs, Fens, Peatlands	0	0	6.3	38	6.2	38	5.9	36	6.3	38
Bogs, Fens, Peatlands	0	0	11.4	69	9.5	58	14.5	88	12.7	77
Subalpine	0	0	2.2	13	6.1	37	2.8	17	1.8	11
TOTAL	**0**	**0**	**26.3**	**159**	**31.4**	**191**	**26.3**	**159**	**23.6**	**143**

Source: Morton 1995b

Road impacts to wetlands would result in loss of wetland functions due to filling and hydrologic alterations. The filling of wetlands for road construction results in a permanent loss, whereas hydrologic alterations are temporary and occur during construction until drainage through and adjacent to the road is provided. If drainage is not adequate, wetland losses occur from lack of surface and subsurface flow. The loss of functional performance (Morton 1995b) due to roads would be proportional to the area of wetland impacted. Due to the small area of wetlands impacted versus the large amount of wetlands present in the project area, the loss of these functions is not significant to the overall function of wetlands in the project area as a whole.

Timber harvest units located in wetlands vary from 597 acres (Alternative C) to 338 acres (Alternative E) (Table 4-27). These acreages represent up to about 10 percent of the total proposed harvest area, but only 0.8 to 1.3 percent of the total area of wetlands in the project area. Impacts to coniferous forested wetlands range from 132 acres (Alternative E) to 366 acres (Alternative C), or 2.1 to 5.8 percent of the total area of forested wetlands in the project area. Impacts to other wetland types range from 1.3 to 2.1 percent of the total in the project area.

Table 4-27

Summary of Wetland Areas Impacted by Proposed Units and Project Alternative, for the Port Houghton/Cape Fanshaw Project Area

	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E	
Wetland Type	Percent	Area	Percent	Area	Percent	Area	Percent	Area	Percent	Area
Coniferous Forested	0	0	4.5	286	5.8	366	3.6	227	2.1	132
Mixed Forest/Bogs, Fens, Peatlands	0	0	1.9	184	1.3	134	2.1	210	1.7	167
Bogs, Fens, Peatlands	0	0	0.1	7	0.2	16	<0.1	5	<0.1	4
Subalpine	0	0	0.2	43	0.4	82	0.4	74	0.2	34
TOTAL[1]	**0**	**0**	**[1.2]**	**523**	**[1.3]**	**598**	**[1.2]**	**516**	**[0.8]**	**338**

[1] Totals for percent are weighted by total area of all wetland types and are thus not additive.

Source: Morton 1995b

Timber harvest alternatives would potentially alter wetland functions. In forested wetlands, timber harvest would result in tree canopy removal and the loss of habitat for forest dwelling species. Clearcut areas would eventually revegetate with a variety of herbaceous plants, shrubs, and saplings. As forest vegetation develops and matures, the wildlife habitat functions of the wetlands would gradually be restored. The habitat value of non-forested wetland types would be less severely impacted by harvest because they would receive less disturbance and they contain structurally less complex communities which recover from disturbance more quickly than forests.

Floodplains

Due to the numerous streams in the project area, each alternative includes between 112 and 140 stream crossings (Table 4-28). Most stream crossings lack significant floodplain development (Class A floodplains that are less than 50 feet wide). Class B floodplains (between 50-100 feet) are crossed 14-20 times depending on alternative, while Class C floodplains include 10-22 crossings. Depending upon alternative, up to 9.4 acres of floodplain would be filled by road construction.

Table 4-28

Number of Floodplain Crossings, by Project Alternative, for the Port Houghton/Cape Fanshaw Project Area

	Alternative								
		Number of Crossings/Number of Acres*							
Floodplain Class	A	B		C		D		E	
A (< 50 feet)	0	95	5.4	115	6.6	81	4.6	96	5.5
B (50-100 feet)	0	18	1.5	14	1.2	20	1.7	15	1.2
C (>100 feet)	0	22	2.5	11	1.3	11	1.3	10	1.1
Total	0	135	9.4	140	9.1	112	7.6	121	7.8

* Acres of impact based on average floodplain width and 50 foot average width of road fill. Calculation is worst case since culvert diameters or bridge lengths are not included as impact, and for Class A and Class B floodplains, numerous crossings have no apparent floodplain.

Source: Morton 1995b

All floodplain crossings have been field-inspected. In the project area, floodplains are generally narrow and sharply defined by steep-sided stream banks and ravines. Road construction across floodplains would result in unavoidable filling in floodplains. Road crossings and culverts could increase sedimentation if culvert failures due to debris jams or lack of capacity result in road failures.

All significant streams with fish habitat (Class I and Class II streams) have a minimum 100 ft buffer from ordinary high water marks to timber harvest activities. Since Class I and II streams typically include many Class A floodplains, and all Class B and C floodplains, timber harvest is therefore not anticipated to affect floodplains.

Cumulative Effects

Long-term cumulative effects on mining claims would be increasing access and exposure for mineral exploration due to road construction and timber harvesting. If mining development occurs, road construction would facilitate market access. Cumulative impacts from soil disturbance include the loss of soil productivity over the short term, soil erosion, and increased mass wasting from the proposed harvest and current harvest on Goldbelt, Inc. lands. As described above, mass wasting events are likely to occur 3.5 times more on managed than unmanaged undisturbed lands. Road construction and filling of wetlands and floodplains would result in loss and alteration of some wetland and floodplain functions and values. No additional harvest is planned within or near the project area. Thus, no additional impacts would be projected. Overall, long term effects on soil productivity will be minor.

Subsistence (Issue 8)

ANILCA Section 810 Subsistence Evaluation Process

Section 810 of ANILCA requires a Federal agency, having jurisdiction over public lands in Alaska, to evaluate the potential effects of proposed land-use activities on subsistence uses and needs. Section 810 of ANILCA states:

> In determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands under any provision of law authorizing such actions, the head of the Federal agency having primary jurisdiction over such lands or his designee shall evaluate the effect of such use, occupancy, or disposition on subsistence uses and needs, the availability of other lands for purposes sought to be achieved, and other alternatives which would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes. No such withdrawal, reservation, lease, permit, or other use, occupancy or disposition of such lands which would significantly restrict subsistence uses shall be effected until the head of such Federal agency:
>
>> (1) gives notice to the appropriate State agency and the appropriate local committees and regional councils established pursuant to Section 805;
>>
>> (2) gives notice of, and holds, a hearing in the vicinity of the area involved; and
>>
>> (3) determines that (A) such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of the public lands; (B) the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition; and (C) reasonable steps will be taken to minimize

> adverse impacts upon subsistence uses and resources from such action.

Evaluation criteria used to assess the effects of the alternatives are: (1) changes in abundance or distribution of subsistence resources, (2) changes in access to subsistence resources, and (3) changes in competition from non-subsistence users for those resources. The evaluation determines whether subsistence uses within the analysis area or portions of the area may be significantly restricted by any of the proposed action alternatives. Using the information gathered from the TRUCS, comments from ANILCA 810 Subsistence Hearings, and other relevant cultural and socioeconomic sources, the Forest Service makes distinct Findings by alternative and by resource category, whether there may be a significant restriction of subsistence use. The resource categories evaluated are deer, wildlife, fish, other foods, and timber.

The Alaska Land Use Council's definition of "significantly restrict subsistence use" is one guideline used in the Findings. By this definition:

> A proposed action shall be considered to significantly restrict subsistence uses, if after any modification warranted by consideration of alternatives, conditions, or stipulations, it can be expected to result in a substantial reduction in the opportunity to continue subsistence uses generally caused by: reduction in abundance of, or major redistribution of resources; substantial interference with access; or major increases in the use of those resources by nonrural residents. The responsible line officer must be sensitive to localized, individual restrictions created by any action and make his/her decision after a reasonable analysis of the information available.

The U.S. District Court Decision in Kunaknana vs. Watt provided additional definitions of "significant restriction of subsistence uses" and is also used as guidelines in the Findings. The definitions from this decision of record are as follows:

> Significant restrictions are differentiated from insignificant restrictions by a process assessing whether the action undertaken will have no slight effect as opposed to large or substantial effects. In further explanation, the Director (BLM) states that no significant restriction results when there would be "no or slight" reduction in the abundance of harvestable resources and no "occasional" redistribution of these resources.
>
> There would be no effect (or slight inconvenience) on the ability of harvesters to reach and use active subsistence harvesting sites; and there would be no substantial increase in competition for harvestable resources (that is, no substantial increase in hunting by non-rural residents).

> Conversely, restrictions for subsistence uses would be significant if there were large reductions in the abundance of the major distribution of these resources, substantial interference with harvestable access to active subsistence sites or major increases in . . . (non-rural) resident hunting.

In light of this definition the determination of significant restriction must be made on a reasonable basis, since it must be decided in light of the total subsistence lands and resources that are available to individuals in surrounding areas living a subsistence lifestyle.

Direct and Indirect Effects

Subsistence Use Area

The portions of the project area primarily used for subsistence are saltwater and terrestrial areas near the shoreline (Boyle 1995), excepting for deer and bear where hunters have harvested these big game species up to five miles inland from the shoreline in the Farragut Bay North Arm area. The rural communities utilizing the subsistence use areas in the vicinity of Port Houghton harvest a variety of wildlife resources. The unit and road pool was initially designed to avoid most subsistence use areas. Portions of subsistence use areas that are affected primarily occur near the shoreline between Sandborn Canal and state-selected land for all alternatives, and the Sandborn drainage area for Alternative E.

Resources Harvested

Deer - Subsistence deer hunting areas occur in the project area with the largest harvest areas south of Port Houghton North Arm and Salt Chuck, along the west shoreline of Fanshaw Bay, and in the vicinity of Farragut Bay North Arm (Appendix F). Communities that hunt deer for subsistence are Hobart Bay, Kake, Wrangell, and Petersburg. Several deer harvest areas are near or within proposed units (Table 4-29). These areas include the south shoreline of Port Houghton, the northwest portion of Cape Fanshaw, the area north of Farragut Bay North Arm, and the southwestern periphery of the deer hunting area near Salt Chuck.

Access. Deer hunters generally access the project area via boat travel and hunt generally within 3 miles of the shoreline. Travel to the high-elevation hunting areas occurs southeast of Port Houghton Salt Chuck through use of float planes. These modes of access would remain available following implementation of all alternatives, and additional access to some interior historical use areas would occur for the action alternatives through road construction. Additional access would primarily occur at the south shoreline of Port Houghton through the development of LTF sites and road construction. The Little Lagoon LTF site and associated road would allow for more efficient access into the subsistence use area associated with the south shoreline of Port Houghton.

Table 4-29

Units Located Within Historical Subsistence Deer Harvest Areas*

Unit	Alternative B	Alternative C	Alternative D	Alternative E
29127 (166)		168		168
29130 (177)		88	20	
321003 (39)			13	
321008 (53)	20			
321014 (77)		14		
321016 (78)		58		
321017 (88)	56	56	56	
321020 (176)		62		
321021 (100)		38		
321026 (141)	68	68	68	68
321028 (147)	60	60	60	60
321030 (157)	91	91	91	91
332050 (33)	7	7	7	7
332051 (35)			13	
332052 (41)			14	
332060 (43)			36	36
332061 (47)			24	24
332063 (44)			23	
332064 (38)			7	
332065 (175)				21
332066 (50)				33
398130 (22)			97	
Total	**302**	**710**	**1,252**	**508**

*Total unit acreage is shown although, for some units, less than the entire unit is within a deer subsistence use area. Units with less than 5 acres within a subsistence use area are not shown above but include Units 321015 (85), 321024 (128), 312027 (140), 332053 (37), 333067 (57). In addition, portions of 321 and 322 group selection areas are in deer subsistence use areas.
Source: Gunther 1995d

Competition. It is unlikely that the increased roads in the project area would attract more sports hunters to the area because hunting success has been historically low in the project area (Gunther 1995a), and deer mainland populations are typically lower than island populations due to the increased winter snow levels. The effort needed to travel to the project area coupled with the low probability of a successful hunt are expected to continue to deter hunters from utilizing the area outside of hunters from a logging camp. Fay and Thomas (1986) state that, when deer populations are high near a community, most of the community deer harvest occurs within 30 miles of that community. Fewer hunters engage in deer hunting when they must travel greater distances. The number of

active deer hunters declines where deer are not locally abundant. However, it is possible, that with a future decline in the number of deer near communities, outlying rural areas, such as the Port Houghton/Cape Fanshaw project area, may become increasingly used for hunting. This additional use beyond the expected increase in hunting over time would increase competition. Effects would be expected to be similar for all action alternatives.

All communities reporting deer harvest are considered rural. There have been no reports of deer being harvested by residents from nonrural communities. Thus, there is no comparison provided of rural versus nonrural deer harvest. Increased hunting could occur by residents of the logging camp for this harvest. However, based on the few deer observed in the project area during field investigation and the lack of personal refrigeration, few hunters from the logging camp are expected to utilize the project as a subsistence deer area.

Deer Abundance or Distribution. A total of 19 deer were reported harvested in the project area from 1987 to 1992 with an annual average harvest of three deer (Boyle 1995). Fourteen of these deer were harvested by Hobart Bay residents. The deer population needed to support deer harvest is the number of deer harvested multiplied by 10 which assumes a 10 percent sustainable harvest of the deer population (Flynn and Suring 1989). Three deer harvested each year multiplied 10 is 30 deer needed for annual sustainable harvest in the project area. Personnel from the logging camp for the proposed project would be expected to also harvest deer. The amount of harvest would be expected to be similar to the Hobart Bay logging camp. This could increase the annual deer harvest up to a total of 60 deer. In addition, if current demand is increased by up to 2 percent per year for the next 40 years following harvest, the annual demand would be 19.5 deer multiplied by 10 equals 198 deer, which is 8 percent of the existing deer carrying capacity (2,467 deer) in the project area.

Implementation of the action alternatives would result in a loss of 3 to 14 percent (2,467 deer decreased to an average of 2,333 deer) of the deer carrying capacity within a WAA for the project area (Gunther 1995c). None of the action alternatives would result in a decrease to less than the carrying capacity of 500 deer in any WAA, the minimum number that the ADF&G believes is needed in a WAA to maintain a viable population (ADF&G 1992). Alternative D would result in the greatest decrease in the carrying capacity of deer for WAA 2927 (505 deer) which remains above the minimum number recommended.

The amount and success of hunting by the logging crew for this proposed timber harvest would be expected to be similar to historical harvests by the Hobart Bay logging crew, although hunting areas may be different. Residents of the logging camp would be expected to additionally harvest deer in the interior areas once roads are constructed, rather than only in the historical subsistence areas. To ensure that subsistence and sports hunting of deer does not significantly increase

from that predicted, harvest levels would need to be monitored and appropriate restrictions or regulations imposed to prevent overharvesting and any subsequent restriction of subsistence use. Because of the new roads in the project area, deer harvest impacts may be spread out over a greater area than has historically occurred in the subsistence use areas located primarily near the shoreline. However, the lack of transportation for motorized land vehicles to the project area may limit the use of roads to hiking.

Summary of Findings for Deer. None of the action alternatives directly or indirectly are likely to cause a significant possibility of a significant restriction of subsistence use of Sitka black-tailed deer by the residents of the communities that harvest deer from the project area.

Salmon, Finfish, and Shellfish - Salmon, other finfish (including halibut, herring, cod, rockfish, eulachon, and trout), and shellfish account for 45 percent of all subsistence resources harvested in Southeast Alaska (Kruse and Muth 1990). Harvest of these resources occurs in similar saltwater locations surrounding the project area (Boyle 1995). Impacts from timber harvest to subsistence harvesting of these resources are expected to be similar, and therefore these resources are treated together.

The activities associated with the timber harvest may result in impacts on subsistence resource harvesting of fish and shellfish. These activities include construction and use of LTFs and maintaining a logging camp, as well as road construction and operation. The type of impacts that could result are primarily related to reduction of fish productivity or fish habitat. Each type of impact is discussed below.

Access. Salmon, finfish, and shellfish harvest in the project area occurs from boats in saltwater. Access to these areas would not be restricted through implementation of any of the alternatives. The proposed Little Lagoon and North Point LTF sites are not located in areas normally utilized for salmon, finfish, or shellfish harvesting. The Rabbit Cove LTF site is located on the eastern periphery of an area utilized for fisheries harvesting by the Hobart Bay logging community. During the season that this LTF is utilized, fishers from Hobart Bay may be displaced to other portions of the project area to avoid disturbances by human presence and noise associated with the LTF. The small area occupied by the LTF site (less than one acre) is not considered a significant restriction to subsistence resource harvesting.

Increased access to freshwater areas for fisheries harvest would occur through road construction. However, no subsistence salmon, finfish, or shellfish harvest has historically occurred in any inland area, except directly north of Farragut Bay North Arm. No roads are planned in this area. Thus, new access from road construction would not affect historical salmon, finfish, or shellfish harvest areas.

Competition. Under the no-action alternative (Alternative A), subsistence harvest lands in the area could decline if the Hobart Bay logging camp (a logging camp that conducts subsistence harvest in the project area) closes in 1997 when the existing forested areas of this private land holding are harvested. With the closure of this community; salmon, finfish, and shellfish harvesting may be confined to the areas west of Fanshaw Bay and south of Farragut Bay North Arm. However, recently Goldbelt, Inc. has requested additional land exchange areas from the Forest Service that are located on National Forest lands for timber harvest. If this requested exchange is granted, the logging community may remain in the area beyond 1997.

Increased competition for fish resources is not expected. The proposed timber harvest is not expected to draw more members of the user communities that currently harvest fish both recreationally and commercially in the project area mostly because of the distance between the project area and user communities. Fish harvesting by residents of the logging community for this harvest is likely to occur, and would include harvest by the caterers who supply the catch to the entire logging crew. The amount of harvest would be expected to be similar to that ongoing with the Hobart Bay logging camp. Based on the amount of salmon present in the project area, the harvest of salmon by the logging crew is not expected to affect the total numbers of fish present or changes in the amount of catch from the historical users of the project area. Commercial fisheries harvest also occurs in the project area. There have been no historical remarks that the commercial fisheries harvest has affected subsistence fish harvest or vice versa. Competition among subsistence and commercial uses is not anticipated in the future, primarily because of the low level of subsistence use in the project area.

Fish Abundance or Distribution. Distributional changes and number of fish expected in the saltwater areas surrounding the project area following timber harvest can only be inferred through evaluation of several types of impacts that would occur to fish habitat and water quality. Salmon abundance in marine waters is predominantly dependent on seven factors: (1) number of salmon successfully hatched and reared in freshwater, (2) salmon survival at sea, (3) hatchery releases and their survival at sea, (4) fish harvest regulations, (5) weather, (6) number of fishers, and (7) successful returns to freshwater spawning habitats. In addition, the subarctic boundary current has a substantial influence on overall productivity in Southeast Alaska. Presently, there is a favorable current that typically has a cycle of 20-30 years. It is believed that the peak of this favorable current occurred in 1990, and that decreases in salmon and steelhead productivity are anticipated over the next 10-20 years (USDA-FS 1995b).

The proposed harvest could affect salmon populations in saltwater areas by altering the number of salmon successfully hatched and reared in freshwater in the project area and, to a lesser degree, salmon survival at sea. The distributional changes and number of salmon expected to occur in the project area prior to,

during, and following timber harvest can only be inferred through evaluation of the impacts to fish habitat and water quality. No method has yet been developed that can universally quantify the effects of hydrology and water quality changes in freshwater streams on the number of salmon successfully hatched and reared. Each alternative has the potential for adverse impacts to fisheries populations through degradation in fisheries habitat. The major effects are predicted to occur from sedimentation originating at roads. In addition, timber harvest planned in the watersheds of important anadromous fish streams with high fish escapement would likely affect more fish than harvest planned in areas having naturally lower fish escapement. Other impacts that may affect fisheries resources are increases in the frequency, duration, and volume of peak flows; amount of stream miles exposed to sunlight; turbidity; and increased water temperature.

Salmon survival at sea could be affected by timber harvest either through water quality impacts or human disturbance which would be short-term and occurring at the time of timber harvest. All sediment generated from timber harvest and road construction would eventually reach saltwater. The extent and timing of sediment reaching saltwater is dependent on channel debris, water velocity, peak flow events, gradient, and other forces. The erosional environment at the mouths of streams and ocean currents where sediments are entering saltwater would determine the extent of sediment movement in saltwater. Although it may be impossible to determine the location and timing of sediment entering saltwater, locations receiving greater sediment loads can be described. The most significant impacts to the saltwater environment would occur at the mouths of streams and decreasing in distance from these areas. Estuaries with minimal gradients and low stream velocity that are protected from ocean currents would be more likely to experience sediment impacts compared to exposed shorelines with strong ocean currents. The majority of sediment deposition would occur in shallower slow-moving saltwater areas.

The overall effect of the timber harvest on commercial fisheries resources can be evaluated by the extent and location of sediment generated. Increases in sediment would be expected for all action alternatives. More sediment would be generated by Alternative B, but this alternative also avoids the Sandborn Canal.

Less sediment would be generated under Alternatives E and C, and the least amount of sediment under Alternative D considering all action alternatives. Sedimentation impacts affect the fewest watersheds under Alternative E. Impacts are primarily based on sediment generated from roads rather than units. However, in all watersheds, increase in sedimentation would be less than 100 percent (see Table 4-20).

Noise and other human disturbances in the saltwater subsistence harvest areas would be short-term, occurring during construction and harvest, and would primarily affect the daily location of salmon within these areas.

Of the five fishing areas currently used for subsistence harvesting, one area (Salt Chuck) is distant from the proposed harvest for all action alternatives, and therefore would not be impacted by the proposed harvest. The four remaining areas are Fanshaw Bay, Port Houghton North Shore, North Arm Farragut Bay, and Sandborn Canal (Appendix F). The Sandborn Canal subsistence area for salmon, finfish, and shellfish is at the mouth of this canal distant from the Sandborn Canal estuary where freshwater initially comes within contact of saltwater. Thus, sedimentation effects to this subsistence area would more likely occur from adjacent streams that drain directly into Port Houghton, west of the subsistence use area. Shellfish and bottomfish would be displaced and avoid the area if sediments are transported into this area. As the sediments settle, shellfish and bottomfish would recolonize the area. Generally, the more distant the fishing area is from the source of sedimentation in saltwater, the more likely that the ocean currents would disperse sediments to a wider area with less impacts to a specific area. From present knowledge, there is no documentation of shellfish or bottomfish populations being adversely effected by sediments levels expected from timber harvest that would indicate that there is a significant possibility of a significant restriction on these resources.

If fishing success declines in the Sandborn Canal subsistence use area, fishers would be expected to continue to fish in other areas of Port Houghton. Differences among alternatives are not expected because the Little Lagoon LTF site is about one mile west of this subsistence use area, and this LTF is used for all action alternatives. Thus, roads that contribute sedimentation into Port Houghton near the Little Lagoon LTF site would be used for all action alternatives. Presently, the Hobart Bay logging camp is the only known subsistence user of this subsistence area, although the loggers associated with this project would also be expected to fish in Sandborn Canal.

The Rabbit Cove LTF site is located in an area used by the Hobart Bay logging community for subsistence fishing. Construction and operation of this site would result in fill of up to 0.33 acres and bark deposition and dispersion of up to 0.17 acres for a one season logging operation for Alternatives B and C (McKenzie 1995b). This effect would not significantly affect abundance of subsistence resources in this area.

Alteration of fish abundance along the North Shore of Port Houghton (an additional subsistence harvesting area used by the Hobart Bay logging camp) is difficult to predict due to the existing harvest of Goldbelt, Inc. lands in this area. The proposed cutting for this project in the North Shore area (258 acres for Alternative B, 765 acres for Alternative C, and 645 acres for Alternative D) represents an approximate 15 percent additional increase in timber harvest to the 3,842 acres of Goldbelt, Inc. land holdings which are currently being harvested in this area. Alternatives B, C, and D may be expected to increase sedimentation

impacts to this fish harvesting area which is already impacted by Goldbelt, Inc. harvesting.

Most of the area used for fish harvesting near Fanshaw Bay occurs immediately west of the Cape Fanshaw shoreline. The shoreline portion of Fanshaw Bay has been identified as Alaska State-selected land, and no timber harvest is planned in this area. Since road construction is the major contributor of sediment in streams, an important analysis is the amount of road miles near streams that drain into Cape Fanshaw. These streams would occur in VCUs 82 and 85 (Table 4-30). Alternative C has more road miles than any other action alternative in this area. However, fishing harvest success in a given area of saltwater is generally not directly correlated with adjacent land management activities. This is due to the substantial mobility and migratory patterns of fish. From present knowledge, there is no evidence that anticipated levels of sedimentation under any action alternative would cause a significant possibility of a significant restriction on subsistence use of fish resources in marine water.

Table 4-30

Road Mile Construction in the Vicinity of the Cape Fanshaw Subsistence Fishing Area

	Alternative			
VCU	B	C	D	E
82	20.1	28.1	17.2	10.9
85	0	0	0	0
Total	**20.1**	**28.1**	**17.2**	**10.9**

Source: Gunther 1995d

Summary of Findings for Salmon, Finfish, and Shellfish. None of the action alternatives would affect access or competition among subsistence users for salmon and finfish harvest. Changes in abundance or distribution of salmon or finfish as a result of the proposed timber harvest is not expected to cause a significant possibility of a significant restriction on subsistence use.

<u>Waterfowl</u> - Petersburg is the only community historically known to hunt waterfowl in the project area, and residents state a preference for hunting waterfowl closer to home (Boyle 1995).

Access and Competition. Waterfowl are hunted in the Sandborn Canal, Salt Chuck, and Farragut Bay North Arm. Access to these areas would not be restricted by timber harvest. The presence of logging personnel for the proposed harvest who are residents of rural communities could result in increased subsistence harvest of waterfowl in historical waterfowl hunting areas. Human disturbance may also occur. However, logging would be expected to occur only

during the months of May to October, and hunting pressure would only occur in the early fall months of September and October because most waterfowl depart the area during the summer months. Competition with Petersburg residents is not expected as hunting is at low levels (Boyle 1995).

Waterfowl Abundance or Distribution. Waterfowl hunting areas are the Salt Chuck and Sandborn Canal. The Salt Chuck would not be affected by timber harvest. Timber harvest is planned in tributaries that drain to Sandborn Canal for Alternative E only. Sedimentation from road construction and operation would eventually gravitate into the Sandborn Canal. Sediment reduces the aesthetic quality of streams, inhibits the growth of valuable waterfowl food plants, and damages gravel-and rubble-type stream bottoms (Grizzel 1976). The response of waterfowl to increased sediment loadings as a result of timber harvest has not been documented, although a comprehensive literature search was conducted on this subject for this EIS. Impacts to waterfowl have been documented from sedimentation as a result of dredging. Waterfowl generally avoid areas where the food resources are covered. Impacts are anticipated to be short-term, occurring during and one to three years following timber harvest until plants recolonize the area. Over the short-term, a decrease of waterfowl foraging habitat would occur in the Sandborn Canal for Alternative E. Waterfowl would be expected to continue to forage in the Canal in areas not covered by sediments, primarily in the northern regions of the tidal flats. Subsistence harvest of waterfowl by Petersburg residents would not be considered to be restricted due to the expected continued presence of waterfowl within the Sandborn Canal and the low level of waterfowl harvest by Petersburg residents.

Summary of Findings for Waterfowl - Action alternatives are not expected to cause a significant possibility of a significant restriction of subsistence use of waterfowl by the communities that harvest waterfowl.

Harbor Seals - No restrictions on harbor seal harvest or changes in harbor seal populations are expected under any of the proposed alternatives. Fanshaw Bay is the only reported harvest area in the project area (Cohen 1989), and no timber harvest, road construction, or LTF construction would occur along the shoreline (Alaska state-selected land) of this bay, or any other area immediately adjacent to Cape Fanshaw under any alternative.

Summary of Findings for Harbor Seal. None of the action alternatives would affect access, competition or abundance and distribution of harbor seals in the areas used for subsistence hunting of harbor seals. There is no significant possibility of a significant restriction of subsistence use of harbor seals in the project area.

Furbearers - **Access**. Trapping areas are generally accessed by boat. Access is not expected to increase from road development because preferred trapping areas

are close to the shoreline. Access would remain available for furbearer trapping through implementation of all action alternatives.

Competition. The no-action alternative may result in a decrease in marten trapping if the Hobart Bay logging camp is no longer be present after 1997. The camp previously harvested five marten on the North Shore of Port Houghton in 1991. Increased trapping could occur by the logging camp that would harvest timber for this project. Due to the low numbers of furbearers trapped historically, competition is not expected to increase.

Communities that have historically harvested marten include Petersburg, Wrangell, Hobart Bay, Petersburg, and Juneau. This latter community is nonrural, whereas all other communities are rural. Only one marten was trapped by a Juneau resident in 1991. Competition between rural and nonrural users is not believed to occur for marten.

Furbearer Abundance and Distribution. Historical subsistence furbearer trapping areas are provided in Appendix F. Most of the suitable habitat for marten and river otter in the project area occurs along the shorelines of both saltwater and freshwater, with the river otter habitat occurring primarily in shoreline areas (Gunther 1995a). No timber harvest or road construction is proposed within 500 ft of beach fringe, 1,000 ft of estuaries, and 100 ft. of Class I and II stream buffers, excepting for LTF sites. Under the action alternatives, LTF and road associated construction would occur in beach fringe areas. Acres disturbed for LTF construction, and associated camp and sort yards, would be up to a maximum of 56 acres for Little Lagoon, 4 acres for Rabbit Cove, and 5.3 acres for North Point. These areas would be considered suitable habitat for marten and river otter. All action alternatives would utilize the Little Lagoon LTF, Alternative B would additionally use the Rabbit Cove LTF, and Alternative C would additionally use both the Rabbit Cove and North Point LTFs.

Of the 34,791 acres of suitable marten habitat in the project area, the loss of up to 65 acres (0.002 percent of the suitable habitat in the project area) for LTF construction would not affect overall density and distribution of marten for any action alternative.

Other historical furbearer trapping areas include the Port Houghton North Shore. Harvest units bordering these areas include Units 311147 (17), 381199 (5), and 381140 (18). Less than five acres of these units occur within subsistence furbearer trapping areas. This small amount of harvest in this historical use area should not effect the overall marten or river otter density in this portion of the project area.

The south and southwest shoreline of Port Houghton is also a historical use area. Up to 140 unit acres would be harvested in this historical use area by Alternative D, 49 acres for Alternative E, and the other action alternatives have no units

affecting more than 5 acres of subsistence use areas (Table 4-31). Group selection areas also occur in this portion of the project area. A 25 percent harvest is planned in these areas with additional harvests planned over the next 120 years. Significant restrictions on subsistence harvesting as a result of harvest in this area are not expected to occur.

Table 4-31

Unit Acres Located Near the South and Southwest Shoreline of Port Houghton Where Historical Furbearer Trapping has Occurred*

	Alternative			
Unit	B	C	D	E
321002 (46)			5	
321003 (39)			13	
332052 (41)			14	
332053 (37)			13	
332054 (36)			39	
332064 (38)			7	
333077 (34)			49	49
Total	0	0	**140**	49

*Unit 332063 (44) has less than 5 acres in furbearer subsistence use areas. Portions of group selection areas (321, 322 and 332) are also within subsistence use trapping areas.
Source: Gunther 1995d

The action alternatives would alter the overall carrying capacity of 371 marten to 350-356 marten dependent on action alternative: a reduction of about 5 percent. The reduction of marten would decrease trapper success in that portion of the project area where harvest is planned. The number of animals trapped has never been reported as more than 10 animals annually from 1988 to 1993 (Paul 1995), and has typically been five or less marten. Considering harvest over eight years, the annual harvest averages 6 marten. The population needed to support 6 marten is 15 marten considering a 40 percent sustainable marten harvest (Flynn 1992).

Considering a 2 percent increase over the next 40 years following harvest, the total number of marten needed to support subsistence harvest would be 34 marten. There should be no concern that timber harvest would result in a significant possibility of a significant restriction of subsistence marten harvest.

The river otter carrying capacity of 97 river otters would not be altered by the action alternatives (Gunther 1995c). Because no one has ever reported harvesting river otter in the project area, no restrictions of subsistence use would occur.

Summary of Findings for Furbearers. None of the action alternatives would create a significant possibility of a significant restriction of subsistence use of furbearers by the residents for any of the communities that harvest furbearers through the reasonably foreseeable future.

Moose - Moose are a subsistence resource, although the TRUCS review did not include moose in the analysis. Moose hunting has occurred in the project area and effects to this resource in consideration of the potential for subsistence use is described below.

Access. Road construction in the project area could increase subsistence harvest of moose by facilitating access to freshwater riparian areas where moose primarily occur. No restriction in access due to timber harvest is projected.

Competition. The total number of moose successfully hunted in the project area is two moose per year by the communities of Hobart Bay and Petersburg. It is possible that road construction could attract new moose hunters to the project area that have not previously hunted in the area before. If the Hobart Bay logging community closes in 1997, then the number of moose hunters may decrease, but this may be offset by new hunters from the logging camp for this project. Although no habitat capability model has been developed for moose, it is believed that they occur only in low numbers in the project area. The field crew during 1994 saw considerable moose tracks but few, if any, moose during ambulatory surveys because of their quick response to depart the area upon the sound of humans. It is believed that there are too few moose in the project area at this time to attract more hunters and increased competition.

Moose Abundance and Distribution. Moose prefer willow and cottonwood habitats which generally do not occur in the project area. Other areas used by moose are old-growth forests within 300 ft of saltwater and large river areas. Beach fringe in the project area is within 500 ft of the shoreline and would not be harvested for any action alternative. No major rivers occur in the project area. Some harvesting would occur in the larger streams of the project area which include the Sandborn tributaries, Cat Creek, and Negro Creek. Alternative B would have the least amount of harvesting in these areas (1,510 acres) than the remaining action alternatives (2,000 acres to 2250 acres), and thus would result in less habitat loss. However, a minimum of 100 ft of old growth habitat in Class I and II stream buffers would be protected for all action alternatives.

Moose also prefer south-facing slopes within the 500 to 1,000 ft. elevation level. South-facing slopes occur primarily in the southern portion of the project area near Cape Fanshaw, in the southeast drainage of Sandborn Canal, and along the northeast shoreline of the North Shore of Port Houghton. These areas are not planned for timber harvest.

The action alternatives would result in the increased production of deciduous foliage in harvested areas due to increased sunlight. These conditions would occur up until secondary succession closes the forest canopy. Subsequently, foliage production would decrease. Food resources for moose would increase in the short term with more foliage produced, but would return to existing conditions or less than existing conditions when the overstory matures dependent on the amount of shade produced.

Summary of Findings for Moose. Considering the present low levels of moose harvest (two per year), the negligible loss of habitat, and the increase of foliage production following timber harvest which results in more favorable moose habitat; subsistence harvest of moose is not expected to be altered by the action alternatives. Implementation of the no-action alternative (Alternative A) would also show no change or a decrease in subsistence hunting of moose. There is no significant possibility of a significant restriction of subsistence moose hunting in the project area.

<u>Mountain Goat</u> - Mountain goat are a subsistence resource in the project area only for the communities of Haines, Klukwan, and Hoonah. Because none of these communities have harvested mountain goat from the project area, there will be no effect on subsistence use.

Summary of Findings for Mountain Goats. None of the action alternatives would create a significant possibility of a significant restriction of subsistence use of mountain goats by the residents of the communities for which mountain goats are considered a subsistence resource.

<u>Black Bear</u> - Black bear are hunted by both subsistence and sports hunters. Since 1986, 73 percent of the known harvest in the project area is by nonresidents that use a guide to hunt bear (Paul 1995). The remaining hunters are residents of Juneau (4 bear successfully hunted since 1986), Petersburg (2 bear), Hobart Bay (3 bear) and other non Southeast Alaska communities (2 bear). If the residents of rural Southeast Alaska that hunted bear in the project area considered their hunt a subsistence harvest, then this harvest would represent 12.5 percent (5 bears) of the entire bear harvest in the project area since 1986.

Access. Historical access to the project area for hunting bear for both subsistence and sports hunting includes boats and float planes followed by hiking into the forests and riparian areas where bears occur. These access routes would remain viable. Additional access to bear would be through roads, although historical subsistence areas do not occur in areas planned for extensive roading. However, new access could open up new areas for subsistence bear harvest.

Competition. Subsistence bear harvest from rural communities averages up to two bear per year (Boyle 1995). Annual nonsubsistence harvest is four bear. A

carrying capacity of 278 black bear following implementation of any of the action alternatives is believed to be able to support a total annual harvest level of up to 6 bear including both subsistence and nonsubsistence hunters. Competition among rural subsistence and nonrural sports hunting is not expected to result from a decrease in the carrying capacity of 20-25 bear expected from the action alternatives. Even if sports hunting of bear increases as a result of road construction, the low bear harvest relative to the carrying capacity is not expected to decrease hunting success. Crew from the logging camp for the proposed harvest may also hunt bear, although the lack of personal refrigeration would likely limit interest. However, the new roads could attract new hunters to the area with similar impacts as described for mountain goats.

Bear Abundance and Distribution. The no-action alternative (Alternative A) would maintain the present status of subsistence use of black bear. Subsistence use could possibly diminish in the project area if the Hobart Bay logging camp closes, although camp residents have historically killed only one bear per year in a relatively small portion of the project area.

The carrying capacity of black bear is expected to decrease by 6 to 9 percent for all action alternatives in WAA 2927, and 9 to 10 percent in the carrying capacity for WAA 1601. For existing conditions, the carrying capacity is 278 bear which would decrease to 253 to 258 bear for all action alternatives (Gunther 1995c). The decrease in bear population in the Chatham Area would primarily occur outside the areas used for subsistence for Alternatives B and C. Thus, bear abundance in the subsistence areas for these two alternatives would not be altered.

Harvest for Alternative D includes two areas that have previously been used to hunt bear: the Sandborn Canal and North Fanshaw (Appendix F) (Boyle 1995). Timber harvest is planned in Unit 341110 (162) (15 acres) of the Sandborn Canal, utilizing helicopter yarding to eliminate road construction in this area. Impacts to bear and subsistence hunting would be insignificant. At the shoreline of North Fanshaw, Unit 332064 (38) (7 acres) occurs in this bear subsistence use area. Group selection harvest is also proposed for the low lying areas in North Fanshaw where bear hunting is reported, but would not substantially reduce habitat in this area. In these group selection units, approximately 25 percent of the unit acres would be harvested in patches of two acres or less in size, and yarded with a helicopter, minimizing road construction and human disturbance in this area. Bear movement and population density is not expected to be altered in these group selection cuts. Several studies have shown that, although black bear prefer a diversity of vegetation communities, with early successional stages providing good foraging sites, they will not forage far from cover provided by mature to old-growth forest stands (Erickson 1965, McCollum 1973, Lawrence 1979, Barber 1983, Schwartz and Franzmann 1983). Females have been reported to forage not more than 330 ft from forested cover (Herrero 1978, Rogers 1977). The 2-acre patch cuts proposed for group selection areas should provide preferred habitat for black bears. Under Alternative D, no timber harvest or road construction is

proposed for any other subsistence bear hunting area. In summary, bear density is not expected to be substantially altered for this alternative in areas used for subsistence.

Alternative E would result in the harvest of timber in the Sandborn Canal area and North Fanshaw, areas where subsistence harvest is reported to occur. Unit 341105 (129) (47 acres) is within subsistence bear hunting area at Sandborn Canal. Units 341101 (123) and 341103 (135) are also within the Sandborn Canal hunting area, but less than 5 acres of each of these units occur in the subsistence use area. Impacts to bear production capability in subsistence use areas is considered insignificant and would not affect hunting success.

An additional effect of harvest on black bears is bear/human interactions and conflicts that predominantly occur in logging camps. Without mitigation practices, bears could be attracted to logging camp areas and consequently destroyed by logging personnel. The use of floating camp facilities can reduce the likelihood of conflict. Sanitary waste disposal is critical in both land based and floating logging camp facilities to minimize human/bear interaction. Additionally, human/bear interactions during timber harvest could result in negative encounters and the subsequent loss of bears.

Summary of Findings for Bear. None of the action alternatives would create a significant possibility of a significant restriction of subsistence use of bear by the residents of any of the communities that harvest bear for subsistence through the reasonably foreseeable future assuming that black bear harvest is monitored and regulated to prevent over harvesting.

Community Effects

Petersburg/Kupreanof - Petersburg/Kupreanof residents report accessing subsistence harvest areas in the project area by boat and floatplane. None of these transportation means would be affected by the proposed action alternatives, although roads would facilitate entry into the project area interior. Competition with logging camp personnel is not expected to occur for subsistence resources, primarily due to the current low harvest levels in the project area.

Wrangell - Based on the low subsistence use of the project area by Wrangell residents, none of the action alternatives are expected to restrict use of subsistence resources by these residents. Some subsistence use areas may have slightly decreased populations of subsistence resources from implementation of the action alternatives, although this change is not expected to significantly alter subsistence resources. Wrangell residents have also reported trapping furbearers on the south shore of Port Houghton where slight declines in marten populations are expected to occur following timber harvest for the action alternatives.

Kake - None of the action alternatives would substantially restrict the use of subsistence resources by Kake residents. Kake residents report harvesting only deer from the project area (Kruse and Frazier 1988), with no harvest between 1987-1992 (ADF&G 1992b).

Hobart Bay - Based on known existing land exchanges between Goldbelt, Inc. (the Native-owned corporation that manages the Hobart Bay logging camp and owns the private land where timber harvest is presently occurring in the project area) and the Forest Service, the Hobart Bay logging camp is scheduled to close by the end of 1997 (Dwyer, personal communication, 1994). Goldbelt, Inc. has recently requested an additional land exchange with the U.S. Forest Service. If this land exchange occurs, then the camp may continue to remain open beyond 1997.

The Hobart Bay land-based logging camp is located on the mainland directly north of Port Houghton. Residents conduct subsistence hunting and harvesting on Forest Service lands. Most hunting access is by boat since almost all motor vehicles are company owned. However, few employees have boats at logging camps, and gas is an expensive commodity in remote areas. Because most employees only reside at the camp from May to October, and work long hours during the day with a work week typically from 6 to 7 days long; subsistence hunting is limited. In addition, many employees are single, eat and sleep at the bunk house, and have no personal refrigeration. As a result, the majority of subsistence harvest occurring at Port Houghton is limited to fishing.

Access

Traditionally access to the Port Houghton/Cape Fanshaw project area has been limited to boat or floatplane. These modes of access would not be altered through implementation of the action alternatives. The construction of roads into the interior of the project area would allow motorized access and increase ease of entry to areas which previously were difficult to access. Road construction on the north shore of Port Houghton would increase the existing network of roads on the Goldbelt, Inc. lands. When these roads are constructed, the logging camp at Goldbelt, Inc. is expected to be closed. Use of the road system following closure of the logging camp is unknown. Roads constructed on the south shore of Port Houghton would be accessible only through the LTFs. This would restrict road use to vehicles transported to the project area by boat, most likely off-road vehicles (ORVs) such as motorcycles and three-wheel vehicles. The Alaska Marine Highway System does not presently serve the project area.

Residents of subsistence communities have expressed concern that increased access from road construction would have an adverse effect by increasing competition among hunters for the resources (Petersburg public scoping meeting 9/27/94). Under the TLMP standards and guidelines for subsistence (1991), the Forest Service must maintain reasonable access to subsistence resources, but may restrict the location, timing, and means of access where it is necessary to maintain healthy

populations of subsistence resources (TLMP 1991 pg 4-67). The new roads in the project area would increase local forest interior access but the long distance between the project area and user communities would likely negate any additional use outside of the logging camps within the project area. It is believed that the current subsistence harvesters that utilize the project area are those interested in an isolated remote setting and non-motorized interior travel. Motorized subsistence hunters generally utilize areas closer to their communities, as they are more interested in obtaining subsistence resources as quickly as motorized travel allows. However, if subsistence resources become depleted near communities, motorized travelers would need to travel further to obtain similar harvest levels. The potential impact would be from motorized travel by residents of logging camps in the project vicinity. Impacts would be limited to big game that would be more accessible during and following harvest due to the new roads. If the use of motorized vehicles for harvesting big game is restricted, the impact should be substantially less.

Competition

The most likely source of increased competition for subsistence resources would come from the logging camp personnel associated with the proposed timber harvest. Based on historical and current subsistence use information from the Hobart Bay camp, logging camp personnel associated with this timber harvest would be expected to harvest deer, salmon, finfish, mountain goat, and black bear in or near the project area. Since most logging personnel would probably meet residency requirements and qualify as subsistence users, they would also have an opportunity to utilize the increased road access to interior portions of the project area, although private vehicle use may be limited. Resource harvest by logging camp residents would only occur during the periods of active timber harvest and would discontinue after the sale is complete or during winter months. The primary limiting factor is that most residents of logging camps receive meals from caterers and do not have their own refrigeration, limiting most subsistence harvest to smaller foodstuffs that do not require long-term refrigeration or the expense of flying meat out. Harvest of large mammal resources occurs but is limited. Following harvest, there would be no long-term competition for subsistence resources from logging camp personnel.

Black bear is the only subsistence resource reported harvested in the project area by non-resident hunters. Public scoping comments from guides indicate that they use the Port Houghton/Cape Fanshaw project area for game hunting because of the undisturbed natural environment and abundant black bear. Timber harvest activities could reduce use of the project area by non-resident hunters and guides who seek a wilderness experience in an undisturbed setting. Increased competition from sport hunters is not anticipated. Rather, is it possible that sport hunter use of the project area could decrease.

Abundance and Distribution

The proposed timber harvest would decrease the amount of old-growth forest (volume classes 4-7) by approximately 6 to 9 percent from existing conditions. Effects to most subsistence wildlife species are also expected to result in a similar decrease. The habitat capability models for MIS species predicted a similar decline in wildlife carrying capacity with most species having decreases of less than 10 percent, except for deer in WAA 2927 where the decrease is 12 percent for Alternative D and black bear in WAA 2927 where the decrease is 17 percent for all action alternatives. Because the harvest levels of subsistence resources are low, the decrease in the carrying capacities and wildlife populations as a result of timber harvest is not expected to affect hunting success of terrestrial wildlife species.

Cumulative Effects

The analysis conducted for the proposed timber harvest assumed that all Goldbelt, Inc. lands are clearcut. No other historical, present, or future timber harvest is known to occur in the project area or adjacent to the project area at least through the year 2010. Beyond 2010, timber harvest plans are unknown. For those wildlife species whose habitat capabilities can be projected, subsistence and non subsistence harvest is obtainable for at least the next 40 years following harvest assuming a 2 percent increase in subsistence use each year. There are no foreseeable future timber sale projects scheduled for the project area.

ANILCA Section 810 Resource Findings

Determinations

Section 810(a)(3) of ANILCA requires that, when a significant restriction may occur, determinations must be made in regard to whether:

- Such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of public lands;
- The proposed activity will involve the minimum amount of public lands necessary to accomplish the purposes of such use and occupancy, or other disposition;
- Reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting form such actions.

<u>Necessary, Consistent with Sound Management of Public Lands</u> - The alternatives proposed in the Port Houghton/Cape Fanshaw EIS have been examined to determine whether they are necessary, consistent with sound management of public lands. In this regard the National Forest Management Act of 1976, ANILCA, Alaska Regional Guide, TLMP (1979), TLMP 1986, Alaska State Forest Practices Act, and the Alaska Coastal Zone Management Program have been considered.

ANILCA placed an emphasis on the maintenance of subsistence resources and lifestyles. However, the Act also provided for the Forest Service to make timber available for harvest from the Tongass National Forest. The Tongass Timber Reform Act directed the Forest Service to seek to provide a supply of Tongass timber to meet market demand. Demand for timber from the Tongass National Forest is expected to remain high for the foreseeable future.

The action alternatives presented here encompass four different approaches that would produce the resources that would best meet the needs of the American people, and help to achieve multiple use management objectives in the TLMP. All of the action alternatives involve some potential impact on subsistence uses. There is no alternative that would meet TLMP objectives and yet avoid all impacts. Therefore, based on the analysis of the information presented in this document on the proposed alternatives, these actions are necessary, consistent with the sound management of public lands.

<u>Amount of Public Land Necessary to Accomplish the Purpose of the Proposed Action</u> - Much of the Tongass National Forest is used by one or more rural communities for subsistence purposes. The areas of most subsistence use are the areas adjacent to existing road systems, the beach and estuary fringes, and areas in close proximity to communities. Within the project area, the extent and location of subsistence use areas preclude complete avoidance. Areas other than subsistence use areas that could be harvested may be limited by other resource concerns such as soil and water protection, high value wildlife habitat, economics, visual quality, or unit and road design. Effort was taken to protect the highest value subsistence areas. For example, beach fringe and estuary are the highest use subsistence areas and minimal beach fringe and no estuary would be directly affected by road or harvest units under any of the proposed alternatives.

The impact of viable timber harvest projects always includes alteration of old-growth habitat, which in turn always reduces projected habitat capability for old-growth dependent subsistence species. It is not possible to lessen harvest in one area and concentrate it in another without impacting one or more rural communities' important subsistence use areas. In addition, harvestable populations of game species could not be maintained in a natural distribution across the Tongass National Forest if harvest were concentrated in specific areas. A well distributed population of species is also required by the Forest Service regulations implementing the National Forest Management Act.

<u>Reasonable Steps to Minimize Adverse Impact Upon Subsistence Uses and Resources</u> - Reasonable steps to minimize impacts on subsistence have been incorporated in development of the alternatives and project design criteria. Some alternatives were designed to address specific areas of concern expressed during scoping. During development of alternatives, an effort was made to minimize activities that could adversely impact important subsistence use areas and to avoid

harvest in several areas currently used for subsistence. Project design criteria called for locating roads and units outside of important subsistence use areas such as the beach fringe, estuary fringe, and riparian areas adjacent to salmon streams. An additional reasonable step being considered is closing roads to hunting with a motorized vehicle during timber harvest.

The Federal Subsistence Board may use its authority to prioritize the harvest of resources among rural residents when necessary to protect the resource. This type of action, as prescribed by ANILCA, Section 804, may be necessary to ensure the availability and adequate abundance of subsistence resources needed by the rural communities using the project area. The current subsistence resource population levels do not require restriction or prioritization of rural residents.

<u>Draft EIS Conclusions</u> - A preliminary determination indicates that the effects of the action alternatives are unlikely to cause a significant possibility of a significant restriction in subsistence uses for communities that have historically taken resources from the project area. However, a higher than projected increase in demand for subsistence use of deer could result in a significant possibility of a significant restriction in the future, even under the no-action alternative. Reductions in habitat capability for deer resulting from timber harvest would likely exacerbate any potential future restrictions of subsistence use. For this reason, the draft finding is that there is a significant possibility of a significant restriction in subsistence use of deer in the project area.

The record of Decision for the Port Houghton/Cape Fanshaw project will include a final finding relative to ANILCA Section 810 following public comment on the Draft EIS and completion of the 810 subsistence hearings.

Cultural Resources (Issue 9)

Direct and Indirect Effects

Impacts to cultural resources can be classified as direct or indirect, although the distinction between the two is often difficult to make. Impacts can occur due to project-related activities, increased public access, or from natural processes. Impacts resulting from project activities could include total destruction or partial damage due to ground-disturbing actions, unauthorized use of a site area by project personnel, increased pedestrian or vehicular traffic over a site, souvenir hunting or actual looting. Coastal sites could be affected by erosion from waves caused by vessels' wakes, or by bark deposition and dispersion. In addition, problems could arise if hydrocarbon spills occurred on a site, thereby compromising the integrity of the site or the site's potential for radiocarbon dating. Natural processes, such as erosion and sedimentation, can adversely affect sites, and these processes could be exacerbated by timber-related activities. The scope of these natural processes is such that they can affect sites that are physically separated from the point of impact. Virtually all impacts to archaeological or historic sites are permanent and irreversible.

Harvest Units

Based on the 1994 archaeological field and literature survey, no archaeological sites were identified directly within harvest units. Most of the harvest units lie above the 100 ft elevation, which is outside the high potential area for cultural site occurrence as defined by the Forest Service (USDA-FS 1993d). Therefore, there would be no direct impacts to known significant historic or archaeological sites identified directly within harvest units. A total of 38.7 acres were surveyed within proposed harvest units which meet requirements as high potential for the occurrence of cultural resources. Forty-five culturally modified trees (CMTs) occur in some harvest areas; however, these do not meet SHPO requirements as significant sites (Table 4-32). Culturally modified trees are trees that were modified (generally by stone tools or metal axes) by past inhabitants of the area, and are important primarily in delineating areas of past land use.

Under Alternative E, some timber harvest activities could have minor and indirect effects on a significant fish weir site located in the vicinity of Sandborn Canal. It is conceivable that impacts could result from soil erosion, and consequent sedimentation and/or stream channel erosion of an estuary in this area. However, these types of impacts are unlikely due to monitoring and control of sediment runoff that are already considered under the soils and fisheries sections of the EIS.

Roads

Based on the 1994 archaeological field and literature survey, no archaeological sites were identified directly within proposed road areas. Most of the proposed roads lie above the 100 ft elevation, outside the high potential area for cultural site occurrence as defined by the Forest Service (USDA-FS 1993d). A total of 2.1 miles of roads were surveyed which lie within high potential areas for the occurrence of cultural resources.

Road construction would not directly impact known significant cultural resources, but could have secondary impacts on two significant sites and one non-significant site. Road construction could increase sedimentation or erosion in some areas. One road (number 8496) would be within 450 ft of an historic cabin feature. However, the cabin ruin does not appear to meet the eligibility requirements of the National Register, and thus would not be afforded protection under Section 106 of the National Historic Preservation Act. A total of 14 CMTs lie within proposed road construction areas (Table 4-33).

A second road, number 8493, terminates at the North Point LTF. This road may have adverse effects on a significant prehistoric site (see discussion below).

Table 4-32

Results of Direct Impact Survey of Timber Harvest Units

Unit Number*	Final Acreage	Paper Plan Acreage	Acreage Surveyed (Est.)	Date Surveyed	Comments/Results
321001	Unit Dropped	15.6	Not Surveyed	NA	Unit dropped prior to scheduled clearance survey.
321003 (39)	13.0	16.8	4.2	7-10-94	Helicopter Unit. No cultural resources identified in portion surveyed below 100'.
321004 (45)	7.5	56.3	Not Surveyed	NA	Unit boundaries adjusted entirely above 100' prior to field clearance survey.
321011 (70)	9.0	9.5	4.5	7-13-94	Clearance survey in response to crew report of CMTs in vicinity of "Bus Stop" helispot east of unit. One blazed spruce CMT on creek bank at northwest edge unit.
321012 (73)	72.8	80.7	3.6	8-3-94	Clearance survey in response to crew report of CMTs in vicinity of "Bus Stop" helispot west of unit. Two cedar CMTs at 360-380' elevation between units 321011 and 321012.
332064 (38)	7.4	22.1	22.1	7-16-94	Helicopter Unit completely above 100'. Clearance survey in response to crew report of CMTs - 35 CMTs (rectangular and triangular scarred yellow cedar) identified above 200' elevation in unit.
341106	Unit dropped	86.2	4.3	7-20-94	Unit dropped after clearance survey of portion below 100'. Seven spring-board notched stumps identified in unit but no significant cultural resources identified below 100'.

*Total unit acreage surveyed = 38.7 acres

Source: Bowers et al. 1995b

Table 4-33

Results of Direct Impact Survey of Roads

Road Segment*	Road Card Number	Date Surveyed	Total Paper Plan Distance Below 100' Elevation	Distance Below 100' Elevation Surveyed	Cultural Resources in Area of Direct or Indirect Impact	Comments
8493	1/4	7/11/94	0.75 mi	0.75 mil	Prehistoric site with historic component	Terminates at North Point Log Dump (LTF-H) - LTF-H moved to increase distance from Site
8496	1/4	7/3/94	0.35 mi	0.35 mi	Little Lagoon Cabin, CMTs	Terminates at Little Lagoon Log Dump (LTF-A). 14 yellow cedar CMTs within 50' of P-line to max elevation of 80' a.s.l.
84904	1/1	7/18/94 7/19/94	1.60 mi	1.00 mi	Cabin and historic log dump, CMTs	Segment of Road 84904 along east side of Sandborn canal below 100' a.s.l. was deleted (Dallas Hemphill, personal comm. 7/20/94)
84959	1/1	NA	None	NA	Low Potential for Cultural Resources	Road segment realigned from paper plan so that it is entirely above 100' a.s.l.

*Total road mileage surveyed = 2.1 miles

Source: Bowers et al. 1995b

Other roads may have indirect effects on a significant fish weir site in the vicinity of Sandborn Canal. Impacts could result from soil erosion, and consequent sedimentation and/or stream channel erosion of an estuary in this area.

LTFs

A total of 39 acres of proposed LTFs, camps, and sort yards were surveyed for cultural resources during the 1994 field season. All of the proposed LTF locations lie below the 100 ft contour, within the Forest Service's high potential area for cultural resource site occurrence.

The location of LTFs could affect one known significant cultural resource and 27 CMTs. Impacts, although probably not involving direct ground disturbance from initial construction, could result from changed patterns of erosion and sedimentation, bark deposition and dispersion, prop wash from passing vessels, increased access to the site, possible hydrocarbon spills, and possible vandalism or souvenir hunting.

All sites were surveyed for archeological resources in 1994. North Point was further surveyed in 1995. Previous surveys were done at Little Lagoon in 1983, and Rabbit Cove and North Point were surveyed in 1981.

Alternative C is not favorable to cultural resources because it uses the North Point LTF, where archaeological surveys located a significant 2,000 to 3,500-year-old prehistoric site with both intertidal and upland components (Bowers et al. 1995b; Bowers and Betts 1995a and 1995b). The site is located close to the LTF. Although construction of the LTF as planned would not constitute a "direct impact," the archaeological site lies within the LTF Area of Effect (as defined in 36 CFR 800), and therefore would need to be further addressed under Section 106 of the National Historic Preservation Act.

Should Alternative C be chosen, a Memorandum of Understanding would need to be entered into among the Forest Service, Alaska State Historic Preservation Office, and the Advisory Council on Historic Preservation for outlining and developing a monitoring/mitigation plan. The use of the LTF could expose the fragile archaeological resources to degradation. Degredation could occur through trampling, souvenir collecting, unauthorized digging, and possibly the introduction of fossil hydrocarbons into the site area. The area is also a natural fishing spot that could be attractive to workers during their off-duty hours. Waves caused by propellers of passing vessels could cause erosion of intertidal deposits.

Sort Yards

If sort yards are associated within the immediate area of the LTF, the areas associated with the sort yards have been sufficiently surveyed and no additional surveys are anticipated. Should the sort yard be located outside of the 10 acres

surveyed for each LTF, an additional cultural resource survey would need to be completed prior to the establishment of that sort yard. An adequate sort yard location has been identified to provide for the needs of the yard and for the protection of the cultural resource.

Camps

Since the camp locations have not yet been determined under any alternative, each camp location would need to be given a cultural resource clearance prior to its establishment. Should an identified camp location be found to be in direct conflict with an archaeological site, a new location would be located in the vicinity and protective measures established for the site.

National Register of Historic Places

Of the 24 known cultural resource sites in the project area, 12 meet the eligibility requirements for inclusion in the National Register of Historic Places, thereby requiring their further evaluation under Section 106 of the National Historic Preservation Act and 36 CFR 800. Of the eligible sites, two lie within the area of effect of one or more of the project alternatives. These sites have been evaluated for potential adverse effects (Table 4-34).

Table 4-34

Determination of Effect/Eligibility for Known Cultural Resources in the Survey Area

Description	Effect[1]	Adverse Effect[2]	Signif[3]	Integrity[4]	Nat'l Reg. Eligibility[5]	Mitigation[6]
Historic fox farm, CMTs	NO	NO	YES	YES	YES; D	NONE
Historic cabin, CMTs	NO	NO	NO	NO	NO	NONE
Canoe run, CMTs	NO	NO	YES	YES	YES; C	NONE
Historic Lighthouse Reserve, Midden, CMTs	NO	NO	YES	YES	YES; D	NONE
Historic cabin, prehistoric site, CMTs	YES	YES	YES	YES	YES; D	Avoidance, data recovery, monitoring
Prehistoric site, CMTs	NO	NO	NO	NO	NO	NONE
Historic cabin, CMTs	NO	NO	NO	NO	NO	NONE
Historic cabin and log dump	NO	NO	YES	YES	YES; D	NONE
Historic cabins and mine	NO	NO	YES	YES	YES; C,D	NONE
Historic cabin	NO	NO	NO	NO	NO	NONE
Historic fox farm cabin	NO	NO	YES	YES	YES; D	NONE

Table 4-34 (continued)

Determination of Effect/Eligibility for Known Cultural Resources in the Survey Area

	Description	Effect[1]	Adverse Effect[2]	Signif[3]	Integrity[4]	Nat'l Reg. Eligibility[5]	Mitigation[6]
	Historic fox farm cabin	NO	NO	YES	YES	NO[7]	NONE
	Historic fox farm cabin	NO	NO	YES	YES	NO[7]	NONE
	Historic fox feeding station	NO	NO	YES	YES	NO[7]	NONE
	Historic fox farm district	NO	NO	YES	YES	YES; D	NONE
	Historic fox feeding station	NO	NO	YES	YES	NO[7]	NONE
	Historic fox feeding station	NO	NO	YES	YES	NO[7]	NONE
	Historic fox farm log track	NO	NO	YES	YES	NO[7]	NONE
	Historic fox farm residential complex	NO	NO	YES	YES	NO[7]	NONE
	Historic cabin	NO	NO	NO	NO	NO	NONE
	Historic cabin, log dump	NO	NO	YES	YES	YES; C,D	NONE
	Historic pilings, skiff, midden, CMTs	NO	NO	NO	NO	NO	NONE
	Prehistoric fish weir	YES	YES	YES	YES	YES; D	Avoidance, monitoring documentation
	Historic tent platform	NO	NO	NO	NO	NO	NONE
	Historic cabin	NO	NO	YES	YES	YES; D	NONE
	Shell midden	NO	NO	YES	YES	YES; D	NONE
TOTALS	N=24; 2 districts	2	2	19	19	12	2

1 Project will/will not have an effect on this property.
2 Project will/will not have an adverse effect on this property.
3 Site does/does not have historical significance according to National Register Criteria (36 CFR 60).
4 Site does/does not have physical integrity (36 CFR 60).
5 Site is/is not eligible for inclusion in the National Register, and if so according to which criterion as defined in 36 CFR 60.4. Under Criterion A, sites are associated with important historical events. Under Criterion B, sites must be shown to be associated with the lives of persons significant in our past. Under Criterion C a site must embody distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction. Under Criterion D a site must have the potential to yield, or have yielded, information important to the history or prehistory of a region.
6 Recommended mitigation; see text.
7 Site is a contributing element to a historic district.

Source: Bowers et al. 1995b

Cumulative Effects

Cumulative effects on heritage resources occur through natural erosion and weathering, as well as from continued development on lands containing heritage sites.

Much of the project area encompasses territory traditionally used by the Kake Tlingit and the Wrangell Stikine Tlingit. While project activity cannot have an effect on past historic events, continued federal management activities can have a long range, commutative effect on places of importance to the Tlingit. The Forest Service seeks to participate in partnerships and challenge cost share agreements to promote awareness and interpretation of the local heritage.

Historic and prehistoric sites in a project area can be damaged by timber harvest activity. The Tongass National Forest has been consistently implementing the inventory, evaluation, and assessment of effects through the Section 106 process since the early 1980's. If the known sites in the project area are avoided and protected using the appropriate mitigation measures, there should be no additional cumulative effects to these sites. Continuous management of these resources through protective actions, such as those proposed in the Forest Service Research Design and various Federal regulations, can minimize the loss of information potentially contained in these resources.

Recreation (Issue 10)

This section analyzes the direct and indirect effects that timber harvesting and roads may have on recreational activities and opportunities in the Port Houghton/Cape Fanshaw project area. The analysis evaluates the change in ROS classes within the project area, and the effect on existing recreation places. The effect of log transfer facilities (LTFs) on recreational activities, and the effect of the alternatives on the potential inclusion of rivers within the project area into the Wild and Scenic River system are also evaluated. Figures showing existing ROS areas and the change in ROS areas by alternative are included in Appendix I.

Direct and Indirect Effects

Recreation Supply and Demand

The demand for outdoor recreation experiences is expected to continue to increase, primarily through an increased number of out-of-state tourists. Most of these tourists would see the Port Houghton/Cape Fanshaw project area on ferries and cruise ships, but would not visit the project area. Their view of the project area would be of units and roads near Cape Fanshaw rather than within Port Houghton or Farragut Bay.

Other tourists that visit the project area by small boat would primarily view and experience harvest effects at the North Shore, South Fanshaw, and East Houghton portions of the project area that are within 2 miles of the shoreline. Most tourists would be expected to use the project area similar to historical use by recreationists. They would view the harvested areas and roads, and recreate near but not within these areas. Recreational use within the vicinity of Farragut Bay would be expected to be similar to existing conditions. These recreational users

would not be expected to experience a loss of undeveloped character as would more likely occur for those users within Port Houghton.

No campsites or anchorages would be eliminated due to timber harvest. The existing recreational opportunities in the project area would continue to be similar to existing conditions. Recreational features would remain in the project area but portions of the project area would no longer be described as having an undeveloped character. Features representing undisturbed pristine conditions would decrease in size. Recreational fish and wildlife opportunities would be expected to be similar to existing conditions.

Recreational Opportunities

The Port Houghton/Cape Fanshaw project area is characterized by a natural landscape without human modification. The introduction of roads, harvest units, and LTFs into the project area would cause a decrease in primitive conditions and an increase in conditions associated with development. All of the action alternatives would increase the amount of roaded modified (RM) ROS areas and decrease the amount of primitive (P) areas. Table 4-35 shows the relative change in ROS class distribution for each of the proposed alternatives, and Appendix I includes the ROS figures for each alternative.

Table 4-35

ROS Class Summary for All Alternatives (Acres and Percentage)

Alternatives	A		B		C		D		E	
Primitive	66,047	48%	23,565	17%	20,270	15%	20,258	15%	24,115	18%
Semi-Primitive										
non-motorized	53,613	39%	56,003	41%	55,065	40%	54,714	40%	57,922	42%
motorized	17,163	15%	22,249	16%	25,189	18%	21,184	15%	17,810	13%
Roaded modified	0	0%	35,005	26%	36,299	27%	40,666	30%	36,977	27%

Source: Boyce 1995b

Opportunities for recreation associated with roads (RM) would increase, and opportunities for primitive recreational experiences would decrease. Many primitive (P) areas change to semi-primitive non-motorized (SPNM) areas in all action alternatives because of the harvest units and roads in the vicinity. Primitive area boundaries in all of the action alternatives were delineated with the objective that a person in a P area would not be able to view evidence of harvest units or roads. Construction of roads into inland areas would provide access to a larger portion of the project area than currently exists. Alternative C has the most road miles (113 miles), but does not have the most RM area because there are few harvest units near Dahlgren Peak, and this area is designated as SPNM.

Alternative D has the greatest RM area because it has harvest units near Goldbelt, Inc. lands, east of Sandborn Canal, and in the area west of Sandborn Canal. The amount of semi-primitive motorized (SPM) area is similar among all action alternatives because most of SPM area is along the shoreline and is not affected by harvest activities. The slight increase in SPM in Alternative C is because of the proximity of roads north of Farragut Bay North Arm and the visibility of the harvest units to the east.

Recreation Places and Sites

No recreation places or sites would be eliminated as a result of timber harvest. Three recreation places would decrease in size (Table 4-36). These places include Recreation Place 43, which is a high forested area around Jamestown Peak. This recreation place would be reduced in size by 1 to 31 percent with the least reduction in size for Alternative C and the greatest size reduction for Alternative E. This reduction is due to the units and roads planned for each alternative.

Table 4-36

Recreation Places that Would Change in Size from Existing Conditions Under the Action Alternatives

	Size (Acres)				
Recreation Place Area Number	A	B	C	D	E
61	807	771	771	537	764
59	18,779	6,345	6,599	5,545	7,245
43	5,761	4,078	5,689	4,702	3,954

* Alternative A represents the no-action alternative or existing conditions.
Source: Boyce 1995b

Recreation place 61 (Port Houghton shoreline) would decrease in size between 36 to 43 acres dependent on the action alternative (Table 4-36). This decrease in size is primarily from the proposed Little Lagoon LTF and associated road (Alternatives B, C, and E) and units in this vicinity (Alternative D).

Recreation Place 59 would also decrease substantially in size from 61 to 71 percent of its size under existing conditions. This recreation place is a large forested area above Port Houghton with numerous small creeks. The change in size of this place is the result of the change of ROS class to roaded modified due to the addition of units and roads in areas that occur under existing conditions as semi-primitive non-motorized.

Recreation Activities and Use

Timber harvesting would change the recreational use of the area. Most of the current recreational activity in the project area is by residents of the Hobart Bay logging camp immediately north of the project area. Much of the current recreation activity in the project area is hunting, fishing, boating, and general sightseeing/beachcombing. Some commercial recreation companies bring visitors to the area to enjoy the unmodified landscape. The most substantial effects to recreation resources in the project area would occur during active timber harvest when road construction, LTF operations, and other harvest activities would adversely affect some recreation opportunities. The effect of the harvest alternatives on hunting and fishing opportunities would depend in part on the effect of the alternatives on these resources. The effect of harvest alternatives on recreation would also depend on the sensitivity of recreationists to visual change. People who now visit the area primarily because of its unmodified character may choose to recreate at subareas within the project area that are not affected by the harvest activity, or they may choose to go to other parts of the National Forest that still exhibit unmodified landscape character.

Effects by Subareas

For the ease of discussion, the project area has been divided into four subareas. These subareas are North Shore (land north of Port Houghton including Goldbelt, Inc. lands), East Houghton (land south of Port Houghton and east of Sandborn Canal), North Fanshaw (land south of Port Houghton and north of the Chatham/Stikine Area boundary, including Sandborn Canal), and South Fanshaw (land south of the Chatham/Stikine Area boundary). The latter area is within the jurisdiction of the Stikine Area, whereas all other areas are within the jurisdiction of the Chatham Area. Appendix I shows the location of recreation places.

For each subarea, the different action alternatives are evaluated by three topics: (1) the change in ROS classes, (2) the effect on recreation places, and (3) the change in recreation use and opportunities in the area.

<u>North Shore</u> - **ROS**. The ROS classes of the North Shore area directly across Port Houghton from north of the mouth of Sandborn Canal to the east would not change with any of the alternatives. The SPM area would continue to exist within a quarter mile of the shoreline. The SPNM area would exist from the SPM along the shoreline north to the project area boundary, and east to the area north of the entrance to the Salt Chuck where the P area begins.

Portions of the area to the west include harvest units in all action alternatives except Alternative E. Alternative B has five units, Alternative C has 11 units, and Alternative D has 13 units (10 of which would be logged by helicopter). Alternatives with harvest units would result in a change of the ROS classes in this area from P and SPNM to primarily RM.

Recreation Places. There are no harvest units or roads proposed in any of the alternatives at the existing recreation places in the North Shore area. Most of the proposed harvest activity is in the North Fanshaw area. Some of these units would be visible in the distance in the North Shore area. Alternatives B, C, and D have harvest units proposed in the western portion of North Shore area. Because of their visibility, these units would preclude the opportunity for a primitive recreation experience in the high lakes in Recreation Place #6 at the northern boundary of the project area. One unit would be one-half mile from the lakes. Some units in this area would also be visible from the western edge of Recreation Place #11.

Harvesting activities would have little affect on shoreline Recreation Places #24 and 20, but some harvest units and roads may be visible in the distance across Port Houghton in all alternatives. The closest harvest unit to Recreation Place #20 is about two miles distant occurring in Alternatives C and D. The closest harvest unit to Recreation Place #24 is about two miles distant in Alternatives B and C. The closest harvest unit to Recreation Place #14 is about three miles distant in Alternatives B and C. Recreation Places #14, 4, and 5 in the Salt Chuck would not be affected by any of the alternatives.

Change in Recreation Use and Opportunities. As discussed above, Alternatives B, C, and D would eliminate the opportunity for a primitive recreation experience at the high lakes in the northern portion of this area. Shoreline recreation opportunities would remain the same as currently exist. Alternatives B, C, and D would connect roads to harvest units using the existing Goldbelt, Inc. road system, thereby increasing opportunities for motorized recreation. Since there are no LTFs on the north shore of Port Houghton, all motorized access to the Goldbelt, Inc. road system would arrive from the Hobart Bay area.

<u>East Houghton</u> - **ROS**. All of the action alternatives, except Alternative E, have harvest activity east of Sandborn Canal. Alternative B has six harvest units and a LTF at Rabbit Cove. Alternative C has 12 units and LTFs at Rabbit Cove and North Point. Alternative D has seven units that would be harvested by helicopter.

In Alternative B, people travelling in a small boat in Port Houghton would see the activities at the Rabbit Cove LTF, evidence of roads, and five harvest units near the LTF. In addition to this activity seen under Alternative B, people in small boats would also see the North Point LTF activities and an additional unit under Alternative C.

In Alternative D, seven harvest units would be harvested by helicopter eliminating the need for roads. Viewers would be able to see three units in the area. Harvest or salvage operations would alter about 25 to 35 percent of the visual coverage, but the natural appearance of the landscape would remain dominant. Alternative

D would have the least impact compared to Alternatives B and C on recreation in this area.

The primary change in ROS classification east of Sandborn Canal would be the increase in RM area and the decrease in P area. The area around the harvest units and roads would change from SPM and SPNM to RM. The largest change would occur in Alternative C. Because of the visibility of harvesting units and roads, the P area boundary would move to the western ridgetop of the Glen Creek watershed.

Recreation Places. Recreation Places #22, 16, 18, 12, 13, and 4 in the Glen Creek/Salt Chuck area would not be affected by any of the alternatives, because harvest units and roads would not be visible from any of these existing recreation places. The anchorage at Recreation Place #55 would not be directly affected by harvest activities under the action alternatives, but use of the anchorage during harvest of this area would probably be reduced. The closest harvest unit to Recreation Place #55 is less than one-half mile to the west. Alternative C would have a LTF at both the east and west ends of Recreation Place #55 (Rabbit Cove and North Point) and would cause the most disruption during harvesting activities. Alternative D uses helicopter logging to harvest these units and would have the least impact on Recreation Place #55.

Change in recreation use and opportunities

Existing fishing activities in the Glen Creek and Rusty River areas would not be affected by any of the action alternatives. The closest road or unit to Glen Creek is roughly one and one-half miles west in the adjacent drainage, and the closest unit to the Rusty River is about five miles west.

Alternatives B and C include new roads in this area, thereby creating new opportunities for motorized recreational travel.

<u>North Fanshaw</u> - **ROS**. The majority of harvest units and roads in all alternatives are in this area. The primary change in ROS classifications would be the loss of P and SPNM recreation opportunities, and a large increase in RM opportunities. Alternative C has the most total project road miles (113 miles), and Alternative D has the fewest (85 miles). There would be a LTF at Little Lagoon for all action alternatives. The development area associated with the LTF would be screened by shoreline trees and the flat shoreline topography, but visitors close to shore may be able to see development activity above the buffer trees.

Visitors passing by in boats in the Stephens Passage area would be able to see evidence of harvesting at the mouth of Port Houghton, and small boats inside Port Houghton would be able to see evidence of the harvest. The shoreline would be buffered, but people close to shore may still be able to see harvest units in some areas due to the topography.

Comments received during public scoping indicate that Sandborn Canal is an area of special concern. Alternatives B and C would not create any units or roads visible from Sandborn Canal except for one unit, which would be visible from Sandborn Canal. This unit would be harvested by helicopter in Alternative D. Alternative E would have the greatest visual change of any of the action alternatives. One road and two harvest units would be visible to visitors in the Canal.

Recreation Places. Recreation Place #63 consists of the area surrounding Sandborn Canal, one-quarter mile in width from the shoreline. The effect of harvest activities on anchorages and dispersed camping sites for this recreation place would be minimal in Alternatives B and C. Under these alternatives, the closest harvest unit to the dispersed camp site on the eastern shoreline at the mouth of the Canal is one-half mile east on the other side of a ridge. The one harvest unit visible from Sandborn Canal in Alternative D would provide evidence of human modification to visitors in the Canal. The alternative with the greatest effect on recreation in Sandborn Canal would be Alternative E. In this alternative, the nearest harvest unit would be one-quarter mile from the shoreline. The closest harvest unit to the dispersed camp site furthest into the Canal is one-half mile west.

The effect of harvest activities on recreation places along the south shoreline of Port Houghton varies by alternative. In Alternatives B and C, proposed harvest units are at least one mile from Recreation Places #61 and #62. Recreation place #61 (Port Houghton shoreline) would decrease in size from 36 to 43 acres dependent on the action alternative (Table 4-36). This decrease in size is primarily from the proposed Little Lagoon LTF and associated road and units in this vicinity. There are two harvest units in Recreation Place #61 that would logged by helicopter in Alternative D. Both units would be within one-half mile from Recreation Place #62. Activity at the Little Lagoon LTF in all action alternatives would cause disruption at Recreation Places #61 and 62 during harvesting activities. Harvest units and roads would be visible from Recreation Places #25 and 60 (Walter and Rabbit islands). Boat traffic to and from the LTFs in all alternatives would cause minimal disruption at these recreation places during harvest activities.

The closest harvest unit to Recreation Place #33 is the salvage area, about one-half mile distant in Alternative B. Recreation Places # 26 - 30 are on state-selected lands that have not yet been conveyed to the State of Alaska.

The greatest overall change to recreation resources in the project area would occur in Recreation Place #59 which is the largest recreation place in the project area (18,779 acres). This recreation place is a large, forested area with numerous creeks and surrounds the Sandborn Canal. This area is currently in the SPNM ROS class and would change to RM in all alternatives. All alternatives have a

combination of numerous units and roads throughout this area. Harvest units in Alternatives B and D are relatively evenly distributed throughout this recreation place. Alternative C has a forested area north of Dahlgren Peak two miles in width that contains no harvest units and only one road. The western three miles of Recreation Place #59 do not have any harvest units or roads in Alternative E.

Change in Recreation Opportunities. Current recreation activities in this area include boating, camping, beachcombing, hunting, and fishing. Access to existing anchorages, dispersed camping sites, and marine fishing sites would not be precluded by any of the alternatives.

Sandborn Canal is an area where bear hunting and fishing are reported to occur. Alternative D includes one harvest unit that would be logged by helicopter. Because helicopter logging reduces the need for road construction, the effects of harvest activities on hunting and fishing in Sandborn Canal under this alternative would be minimal. Alternative E has numerous harvest units in the Sandborn River drainage. Road construction and modification of the landscape may deter bears from using this area. Road construction in the Sandborn River drainage may also effect salmon habitat through increased sedimentation.

South Fanshaw - **ROS.** The primary change to ROS classes in this area would be the loss of the P area in the inland area. Areas currently designated as P would change to either SPNM or RM.

Recreationists offshore in the Frederick Sound area would be able to discern changes to the project area as a result of all the action alternatives. Harvest activities would be screened from kayakers and small boats close to shore by shoreline trees and the topography. Boaters travelling in the North Arm of Farragut Bay would see harvest activities in the middleground of the landscape, but dense stands of trees along the shoreline would dominate the foreground view.

There would be minor visual changes to the landscape for recreationists travelling in the Whitney Island-Cape Fanshaw area. People travelling on the Alaska Marine Highway would see the project area from about three miles offshore of Whitney Island. One unit in Alternative C would result in a slight visual change to a ridge. The effect of harvest activities on known recreation sites and previously unidentified sites would be minimal. People beachcombing or camping along the shoreline would not be able to see harvest activities in the area.

Recreation Places. No recreation places or sites would be eliminated as a result of timber harvest. Three recreation places would decrease in size (Table 4-36). These places include Recreation Place #43, a high forested area around Jamestown Peak that would be reduced in size by 1 to 31 percent with the least reduction in size for Alternative C and the greatest size reduction for Alternative E (Table 4-36). This reduction is due to the units and roads for each alternative. Presently, Recreation Place #43 provides primitive recreation opportunities, such as hunting,

in the area surrounding Jamestown Peak. Alternatives B, D, and E include harvest units in the northeast section of this recreation place. Alternative C does not have any harvest units within the existing recreation place, but has a harvest unit abutting the northeast boundary of this recreation place. Recreationists in various locations on the north side of Jamestown Peak would likely be able to view harvest units and roads to the northwest, north, and northeast in all action alternatives. The effect of the action alternatives on recreation resources in this area would be to eliminate the opportunity for a primitive recreation experience on the north side of Jamestown Peak.

The effect of harvest activities on the south side of Jamestown Peak and the remainder of Recreation Place #43 would be minimal. Visitors to the summit of the Tangent-Saranac group of peaks may be able to view harvest units which are four to five miles distant. In comparison, there would be little effect to recreation resources for the majority of Recreation Place #46. This area is primarily located on the south-facing slope of the Tangent-Saranac group of peaks. Recreationists in the majority of this area would not see any evidence of harvest activities. People using the north side of Tangent Peak in Recreation Place #46 would be able to see harvest activities about four miles in the distance to the northwest. Visitors to the eastern edge of the recreation place may be able to see harvest units about three miles to the northeast from clearings in the forest.

Change in Recreation Opportunities. Current recreation activities in the South Fanshaw area include boating, camping, beachcombing, and hunting. Access to existing anchorages and dispersed camping sites would not be precluded by any of the alternatives. There are no roads or harvest units planned in the South Fanshaw area where hunting for deer, moose, and mountain goats has historically occurred.

Access to the north portion of the South Fanshaw area would be significantly increased by construction of the road from the Little Lagoon LTF. New recreational opportunities associated with motorized travel would result from all action alternatives. Roads could also be used by hikers and bikers to access inland areas.

Roadless Areas

A roadless inventory was conducted for TLMP Revision. An area has to be a minimum of 5,000 acres to qualify for Roadless designation. The sale area contains two Roadless Areas, Windham-Port Houghton (Roadless Area 308; 165,876 acres) and Fanshaw (Roadless Area 201; 48,751 acres). None of the action alternatives would delete these two Roadless Areas. These inventoried "roadless" areas may be considered for Wilderness recommendation or may be managed for a wide range of other resource management activities.

Special Use Permits

All operators with special use permits would be allowed to continue to utilize the project area. During timber harvest, they would be requested to avoid the areas where active logging is occurring. Outfitters and guides that travel to the area solely to enjoy solitude and undisturbed conditions may no longer travel to Port Houghton if they would prefer not to view harvest areas and roads. However, these outfitters and guides are currently viewing harvested conditions on Goldbelt, Inc. lands in the project area. Outfitters and guides that frequent the Sandborn Canal for hunting would be most affected by Alternative E which would result in timber harvest within the Sandborn Canal drainage. However, overall bear hunting success may be most affected through implementation of Alternative C which would result in the greatest reduction in carrying capacity (refer to the wildlife analysis discussion) among the action alternatives. Hunting in the Salt Chuck or Glen Creek area should not be affected through any of the action alternatives as no harvest is planned in this area.

Outfitters and Guides - The area is used by outfitters and guides for hunting and fishing. The most popular big game animal that is harvested in the project area is the black bear. The majority of the project area is suitable habitat for this species, which allows for recreational hunting throughout the project area. However, due to the lack of roads, hunting is often limited to areas closer to the shoreline. Currently, the area is not frequently utilized, which allows for solitary experiences. No competition among outfitters and guides exists due to the low level of use in the project area. With harvest planned in the project area, outfitters would be expected to concentrate use in areas where harvest does not occur, and may result in an increased likelihood of encountering other outfitters and guides and increasing user competition. If this occurs, then some outfitters may decrease use of the project area even if hunting success remains unchanged.

Outfitters and guides that frequent the area for fishing opportunities are expected to continue to utilize the area similar to existing conditions for all action alternatives. There would be no changes in anchorages, and impacts to marine fisheries resources from the construction of LTF sites on the south shoreline of Port Houghton are insignificant considering the amount of the impact and the size of the saltwater areas (McKenzie 1995b).

Outfitters and guides that visit the project area solely for experiencing undisturbed solitary conditions with no land management activities may desire to visit other areas where their clients cannot view clearcuts and roads.

Cumulative Effects

Timber harvest activities increase the proportion of roaded modified recreation opportunities, and reduce opportunities for semi-primitive and primitive recreation experiences. As harvest activities increase in previously unmodified areas, new opportunities for recreation activities associated with roads would expand.

Recreationists seeking areas with natural settings and a high degree of solitude would be displaced to other areas in the National Forest, or would stop recreating on the National Forest. This displacement to other natural areas may result in increased use of those areas with more social encounters and less opportunity for solitude. The existing conditions for the project area include the assumption that all Goldbelt, Inc. lands would be harvested prior to implementation of the proposed timber harvest. The existing harvested area on Goldbelt, Inc. lands may already preclude recreationists that seek a primitive setting with not harvest activities.

Based on the recreation issues raised during public scoping, the alternative that would have the greatest effect on recreational activities is Alternative E because harvest would occur in the Sandborn Canal which (1) is valued for hunting and fishing opportunities, (2) is desired by some individuals for consideration as a Wild and Scenic River, and (3) has high visual/aesthetic quality. No action alternative would propose harvest in other recreational areas of importance including Salt Chuck, Glen River, and Farragut Bay. No development activities have been slated for State of Alaska lands within the project area. If these areas are proposed for primitive recreational opportunities by the State of Alaska, then their use could be affected because of views into timber harvest areas for the proposed project.

The Cape Fanshaw Natural Area should be unaffected by the proposed timber harvest because its purpose is to preserve Alaska cedar within its boundaries. The Natural Area has not been identified as having attributes of importance to recreationists, and recreational use is not expected to jeopardize the scientific value of this area.

Visual Resources (Issue 11)

In all action alternatives, people in small boats would view visual change. People on the Alaska Marine Highway would discern minimal, if any, change from the existing visual conditions. Travel routes and topography define ten major viewsheds in the Port Houghton/Cape Fanshaw project area. The Port Houghton Viewshed would experience the greatest visual change as a result of any of the alternatives. None of the action alternatives propose units or roads in the areas with high or exceptional visual quality such as the Salt Chuck Viewshed. Units in each of the alternatives would be designed and located, in so far as possible, to help mitigate potential visual impacts. Under Alternative D, a helicopter logging system would reduce the need for roads thereby reducing visual impacts. Alternative silvicultural methods involving partial cutting can reduce visual impacts by softening the alteration to forest cover. Of all action alternatives, Alternative D uses alternative silvicultural methods to the greatest extent. This

increases the total area harvested, but reduces the overall visual contrast created by logging and road construction.

By incorporating mitigation measures into the action alternatives, most areas of all alternatives meet Visual Quality Objectives. Alternative D meets Visual Quality Objectives in all areas. The remaining areas of concern are: (1) Alternative B: Port Houghton and Inner Port Houghton Viewsheds, (2) Alternative C: Port Houghton, Inner Port Houghton and Salt Chuck Antechamber Viewsheds, and (3) Alternative E: Sandborn Canal Viewshed. Elimination or partial cut of units and road relocation or redesign to maintain downslope screening trees would mitigate visual impacts in the areas of concern.

In all action alternatives, the average size of units would be relatively small, from 53 to 58 acres. Only seven of all possible units (excluding group selection and salvage units) would be over 100 acres in size. All the units over 100 acres in size are not included in all the alternatives and most are located in areas that are not seen or are irregularly seen by forest visitors. Units would be distributed across the landscape, primarily within the South Houghton/North Fanshaw portion of the project area with some units east of Sandborn Canal and north of Goldbelt, including lands at the North Shore of Port Houghton. There is at least a quarter-mile and often a half-mile, or greater, buffer between adjacent units. This distribution, combined with the unit size, allows remaining forest buffer between units to soften the visual impact of changes to the vegetative cover.

Direct and Indirect Effects

None of the action alternatives would result in units in the foreground; only LTFs and roads serving the LTFs would be located in the foreground. None of the action alternatives propose units or roads in the Salt Chuck Viewshed or on northern shoreline of either the Salt Chuck Antechamber Viewshed or Inner Port Houghton Viewshed (Appendix G). Alternative B would also have an LTF at Rabbit Cove. Alternative C would have an LTF at Rabbit Cove and North Point. All three possible LTFs would be beaver slides which is the least visually impacting of all possible designs. The development area (log sorting yards, machine shops, etc.) would be screened from views at the shoreline by a minimum buffer of one hundred feet. None of the possible LTFs would be viewed from the Alaska Marine Highway.

Travel routes and topography define ten major viewsheds in the Port Houghton/Cape Fanshaw project area. Major viewsheds are landscapes that people can see as a single unit, although not all of the area within a viewshed may be seen from all of the viewpoints. Appendix G shows the project area viewsheds and viewpoints/photopoints. Alternative A, the no-action alternative, would have minimal to no impacts. The following text discusses the effect of Alternatives B, C, D, and E on each of the ten major viewsheds. Table 4-37 summarizes the effects by viewshed and alternative. Table 4-38 compares the Existing Visual Condition with the Future Visual Condition by VCU.

Table 4-37

Summary of Visual Effects by Viewshed and Action Alternative

Viewshed	Visual change Alternative B	Visual change Alternative C	Visual change Alternative D	Visual change Alternative E	Visual Quality Objective(s) met?
Farragut Bay	No discernible change from natural forest	Same as B	Same as B	Same as B	Yes
North Arm	Change from natural forest to visible harvest activities, but natural appearance still dominant	Change from natural forest to noticeable harvest activities, but disturbances resemble natural patterns	Similar to B, with additional visual mitigation	Same as C	Yes
Frederick Sound[a]	No discernible change from natural forest	Same as B	Same as B	Same as B	Yes
Whitney Island[a]	Barely discernible changes from natural forest	Same as B	Same as B	Same as B	Yes
Mouth of Port Houghton[ab]	No significant change from a existing landscape	Similar to B, slightly more visually impacting	Same as B	Same as B	Yes
Port Houghton[b]	1. Some areas change from natural forest to noticeable harvest activities, but disturbances resemble natural patterns 2. Remainder has no discernible change from existing landscape	Similar to B, more visually impacting	Similar to B with additional visual mitigation	Similar to B, less visually impacting	D and E: Yes B and C: No; both would result in Maximum Modification VQO rather than inventoried Partial Retention VQO
Sandborn Canal	Same as no action alternative	Same as no action alternative	Same as no action alternative	Change from natural forest to noticeable harvest activities, but disturbances resemble natural patterns	Yes[c]

Table 4-37 (continued)

Summary of Visual Effects by Viewshed and Action Alternative

Viewshed	Visual change Alternative B	Visual change Alternative C	Visual change Alternative D	Visual change Alternative E	Visual Quality Objective(s) met?
Inner Port Houghton	Changes from natural forest to strongly apparent harvest activities	Similar to B, more visually impacting	Change from natural forest to visible harvest activities, but natural appearance still dominant	Same as No Action Alternative	D and E: Yes B and C: No; both would result in Maximum Modification VQO rather than inventoried Partial Retention VQO
Salt Chuck Antechamber	No change from natural forest	Changes from natural forest to strongly apparent harvest activities	Change from natural forest to visible harvest activities, but natural appearance still dominant	Same as No Action Alternative	B, D and E: Yes C: No; C would result in Modification VQO rather than inventoried Partial Retention VQO
Salt Chuck	Same as no-action alternative	Same as no-action alternative	Same as no-action alternative	Same as no-action alternative	Yes

[a] Seen from the Alaska Marine Highway.
[b] Existing clearcut on private land significantly influences the existing visual impression of this viewshed.
[c] Alternative E meets the Modification VQO, but still may not meet public expectations, see text.
Source: Snoey 1995b

Table 4-38

Comparison of Existing Visual Condition and Future Visual Condition

VCU	Existing Visual Condition	Alt. B Future Visual Condition	Alt. C Future Visual Condition	Alt. D Future Visual Condition	Alt. E Future Visual Condition
79	Appears untouched by human activities (Type I)	*Inner Port Houghton Viewshed Only:* Changes in the landscape are strong and appear to be major disturbances (Type V)	*Inner Port Houghton and Salt Chuck Antechamber Viewsheds Only:* Changes in the landscape are strong and appear to be major disturbances (Type V)	*Inner Port Houghton and Salt Chuck Antechamber Viewsheds Only:* Changes are noticed by the average forest visitor, but they do not attract attention. (Type III)	Same as Existing Visual Condition

Table 4-38 (continued)

Comparison of Existing Visual Condition and Future Visual Condition

VCU	Existing Visual Condition	Alt. B Future Visual Condition	Alt. C Future Visual Condition	Alt. D Future Visual Condition	Alt. E Future Visual Condition
80	Appears untouched by human activities (Type I)*	Changes are easily noticed by the average forest visitor, but disturbances resemble natural patterns. (Type IV)	Changes are easily noticed by the average forest visitor, but disturbances resemble natural patterns. (Type IV)	Changes are easily noticed by the average forest visitor, but disturbances resemble natural patterns. (Type IV)	Same as Existing Visual Condition
81	Changes in the landscape are strong and appear to be major disturbances (Type V)	Same as Existing Visual Condition	Same as Existing Visual Condition	Same as Existing Visual Condition	Same as Existing Visual Condition
82	Appears untouched by human activities (Type I)*	Changes are easily noticed by the average forest visitor, but disturbances resemble natural patterns. (Type IV)	Changes are easily noticed by the average forest visitor, but disturbances resemble natural patterns. (Type IV)	Changes are easily noticed by the average forest visitor, but disturbances resemble natural patterns. (Type IV)	Changes are easily noticed by the average forest visitor, but disturbances resemble natural patterns. (Type IV)
83	Appears untouched by human activities (Type I)*	Changes are easily noticed by the average forest visitor, but disturbances resemble natural patterns. (Type IV)	Changes are easily noticed by the average forest visitor, but disturbances resemble natural patterns. (Type IV)	Changes are easily noticed by the average forest visitor, but disturbances resemble natural patterns. (Type IV)	Changes are easily noticed by the average forest visitor, but disturbances resemble natural patterns. (Type IV)
84	Appears untouched by human activities (Type I)	Same as Existing Visual Condition	Same as Existing Visual Condition	Changes are noticed by the average forest visitor, but they do not attract attention. (Type III)	Changes in the landscape are strong and appear to be major disturbances (Type V)
85	Appears untouched by human activities (Type I)	Same as Existing Visual Condition	Same as Existing Visual Condition	Same as Existing Visual Condition	Same as Existing Visual Condition
86	Appears untouched by human activities (Type I)	Same as Existing Visual Condition	Same as Existing Visual Condition	Same as Existing Visual Condition	Same as Existing Visual Condition
87	Appears untouched by human activities (Type I)	Changes in the landscape are not noticed by the average person unless pointed out. (Type II)	Changes in the landscape are not noticed by the average person unless pointed out. (Type II)	Changes in the landscape are not noticed by the average person unless pointed out. (Type II)	Changes in the landscape are not noticed by the average person unless pointed out. (Type II)
88	Appears untouched by human activities (Type I)	Same as Existing Visual Condition	Same as Existing Visual Condition	Same as Existing Visual Condition	Same as Existing Visual Condition

Table 4-38 (continued)
Comparison of Existing Visual Condition and Future Visual Condition

VCU	Existing Visual Condition	Alt. B Future Visual Condition	Alt. C Future Visual Condition	Alt. D Future Visual Condition	Alt. E Future Visual Condition
89	Appears untouched by human activities (Type I)	*North Arm Viewshed Only:* Changes are noticed by the average forest visitor, but they do not attract attention. (Type III)	*North Arm Viewshed Only:* Changes are easily noticed by the average forest visitor, but disturbances resemble natural patterns. (Type IV)	*North Arm Viewshed Only:* Changes are noticed by the average forest visitor, but they do not attract attention. (Type III)	*North Arm Viewshed Only:* Changes are easily noticed by the average forest visitor, but disturbances resemble natural patterns. (Type IV)

* This VCU is viewed in the context of VCU 81 which has a large existing clearcut appearing as a major disturbance.
Source: Snoey 1995b

Farragut Bay Viewshed

Occupants of seasonal dwellings and small boat users viewing the project area from Farragut Bay would not discern any roads or units resulting from any action alternatives. In all alternatives, the viewshed would retain its Existing Visual Condition (Type I), appearing natural and untouched by human activities.

North Arm Viewshed

In this viewshed (Appendix G), people in small commercial or recreational boats would view visual changes to the middleground and background landscape as a result of all action alternatives. In all cases, dense trees at the shoreline would dominate the foreground view. Alternatives C and E would result in more visual change than Alternatives B and D. All alternatives would meet the viewshed's Visual Quality Objectives (VQOs) of Modification and Maximum Modification.

In Alternatives B and D, management activity in the middleground and background landscape would be apparent from Viewpoint S-2 at the end of the waterway (Appendix G). The form and line of the visible units would reflect the surrounding characteristic landscape. Distance and atmospheric conditions would soften the appearance of the units in the background. The units range in size from about 30 to about 88 acres; however, shoreline trees and topography would prevent the viewer from seeing no more than about half of any one unit in the middleground. Under this alternative, the viewer would be unlikely to discern management activity from Viewpoint S-3. The viewshed's Existing Visual Condition is Type I, appearing natural and untouched by human activities. Under this alternative, the condition would be changed to Type III in which the average forest visitor would notice changes in the landscape, but the natural appearance still remains dominant. The effect of Alternative D would be similar to Alternative B, except that minor changes to road locations and silvicultural methods would soften visual changes to the landscape.

As viewed from Viewpoint S-2, the effect of Alternatives C and E would be similar to the effect of Alternative B, except that units in the middleground would shift from northwest to northeast of North Arm. The middleground units, 29126 (145) and 29127 (166), are about 158 acres and 170 acres in size, respectively. However, shoreline trees and topography prevent the viewer from seeing most of the units from this viewpoint. Both units would be viewed from Viewpoint S-3 (Appendix G), where topography would frame the management activity, and accentuate the visual impact. Horizontal forms and lines would reflect the ridgeline and the horizontal line created at the shoreline by dense trees. This alternative would change the visual condition to Type IV, in which changes in the landscape are easily noticed by the forest visitor. The units would appear as disturbances, but resemble natural patterns.

Frederick Sound Viewshed

In all action alternatives, most viewers in the Frederick Sound/Stikine Viewshed (Appendix G) would see changes to the project area from a distance of eight to ten miles away on the Alaska Marine Highway (Appendix G). Small boat users may view the project area from varying distances from the shoreline. However, steep viewing angles and shoreline trees would screen most units in all alternatives from viewers close to shore. In all alternatives, units would be in the saddles of deeply folded and steep topography. Management activities would be difficult to discern from the existing, natural mosaic of modulated greens and browns resulting from a variety of growing conditions caused by steep slopes, microclimate, and soil conditions. Alternative D would use helicopter harvesting which would further reduce the potential of visual impacts created by road construction. In all alternatives, the viewshed would change from Type I—natural, untouched by human activities—to Type II which appears natural, and changes to the natural landscape are not noticed by the average viewer unless pointed out. All action alternatives would meet the viewshed's Visual Quality Objectives of Partial Retention, Modification, and Maximum Modification.

Whitney Island Viewshed

In the Whitney Island viewshed (Appendix G), most people see the project area from the Alaska Marine Highway about three miles offshore of Whitney Island. Small boat users see the project area from varying distances from the shoreline. Alternatives B, C, and D would result in minor visual changes to the landscape on the distant shore of Point Hobart. At a distance of ten to thirteen miles, these would appear only as patterns of light and dark. Alternative C would create additional visual changes closer to the viewer. Unit 321014 (77) would result in minor and probably unnoticed changes to a ridge (Appendix G). Alternative E would have the same effect as the no-action alternative. For all action alternatives, the viewshed would continue to appear natural, untouched by human activities (although sensitive viewers might be able to discern the large existing

clearcut on private land on Point Hobart). All action alternatives would meet the Visual Quality Objectives of Retention, Partial Retention, and Modification.

Mouth of Port Houghton Viewshed

In this viewshed (Appendix G), people in small boats, on the Alaska Marine Highway, and whale watching in the vicinity of The Five Fingers would observe changes resulting from all of the action alternatives. The Existing Visual Condition of most of the viewed area is classified as Type I—natural, untouched by human activities. However, this classification ignores the large clearcut on private land that significantly influences the visual impression of the entire viewshed. At a distance of two to five miles, viewers can recognize Point Hobart's existing clearcut on private land as human-caused activity. Taking into account the existing clearcut, the Existing Visual Condition of the Mouth of Port Houghton Viewshed would be more likely Type V rather than Type I. Type V describes areas in which changes in the landscape are strong and would be obvious to the average forest visitor. The changes stand out as a dominating impression of the landscape. There will be additional harvest on lands that have been recently gone from the Forest Service to private ownership. This will increase the viewer's perception of change in the viewshed.

Most of the changes created by the action alternatives would be viewed in the background at a distance of six to ten miles. At this distance, changes would be viewed as patterns of light and dark (Appendix G). Since untouched slopes in the vicinity are tree covered from shore to ridge, the average viewer is likely to suspect that the change in coloration is due to human activities. None of the action alternatives would result in a change to a Type V Existing Visual Condition. Since most of the changes occur in the background and would be subordinate to the characteristic landscape, all of the action alternatives would meet the Visual Quality Objectives of Partial Retention and Modification.

Port Houghton Viewshed

Of all the viewsheds in the project area, the Port Houghton Viewshed (see Appendix G) would experience the greatest visual change as a result of any of the alternatives. Most viewers in this viewshed would be on the small boat route. The effect of the visual changes would vary by viewpoint and alternative and not all alternatives would meet Visual Quality Objectives in all areas.

The Little Lagoon LTF is located in this viewshed in all action alternatives. The potential development areas would be buffered from the shoreline and located on fairly level topography relatively close to sea level (less than one hundred feet elevation). Distance and small islands in front of the shoreline at Little Lagoon would minimize the visual impact to people on the small boat route. Viewers closer to the shoreline may see the development areas above tops of the buffer trees. The visual effect would depend upon the specific location of facilities. For

example, a red-colored machine shop at a high elevation within the development area would have a greater impact than a log sorting yard at the same location because the color of the logs would not contrast significantly with the surrounding landscape.

Viewpoint C-6 is located on the south shore of Robert Island. If state-selected land in this area is developed for a marine park, this viewpoint would be significant in evaluating visual impacts. In Alternatives B and C, visitors on the shoreline of Robert Island would see roads and units in the middleground above shoreline trees. In particular, Unit 321013 (72) and Route 8498 (Appendix G) would be apparent. This road and unit would be in a prominent location on the nose of a ridge. In Alternative C, viewers would see more disturbance. No changes would be apparent in Alternatives D and E. From this viewpoint, the viewshed's Existing Visual Condition is Type I, appearing natural and untouched by human activities. Under Alternatives B and C, the condition would be changed to Type IV in which changes in the landscape are easily noticed by the average forest visitor and may attract some attention. From this viewpoint, Alternatives B and C would not meet the Visual Quality Objective of Partial Retention because the management activity would have enough contrast to form a new focal point when viewed in the middleground distance.

Viewpoint C-7 is on the small boat route and has a 360 degree view of the project area. The Existing Visual Condition of most of the viewed area is classified as Type I - natural, untouched by human activities. However, this classification ignores the large clearcut on private land. In this viewshed, the visual influence of the clearcut is tempered by the fact that the entire viewshed is not seen in the context of the clearcut, i.e., the viewer must turn away from the clearcut to see the southern shoreline. However, with the detail of a large clearcut so close at hand, the general impression is that of a disturbed landscape.

Alternatives B, C and D would result in new units and roads in the vicinity of the existing clearcut on private land. These could be viewed from Viewpoint C-7-a and Viewpoint C-7-b (Appendix G). Alternative C would result in more units and roads in the vicinity of the existing clearcut on private land. A tuft of trees left on the ridge between Units 311147 (17) and 311146 (8) could draw attention to the new harvest units. Alternative D is similar to Alternative C, resulting in more units and roads in the vicinity of the existing clearcut on private land. But the harvest in Alternative D would be distributed over a wider area than in Alternative C (Appendix G) eliminating a patchwork of units on a visually prominent ridge. Also the harvest would be by helicopter, lessening the impacts from roads and lines. Since the existing clearcut is visually dominating, none of the proposed alternatives would significantly alter the Existing Visual Condition.

From Viewpoint C-7-c, Viewpoint C-7-d, and Viewpoint C-7-e (Appendix G), the viewer would see the southern shoreline of Port Houghton in the middleground

and background at a distance of more than three and half miles. The lack of foreground focus makes the shoreline seem closer. In all the alternatives, viewers would see about eight to fifteen units ranging in size from about 28 acres to 85 acres. These would be spread over an area behind the shoreline about twelve miles in length with forest buffers between the units. Units would be irregularly shaped. The topography is complex with a number of small valleys and knobs. For Alternatives B, D, and E, the resulting Visual Condition would be Type IV in which changes in the landscape are noticed by the average forest visitor and may attract some attention. The harvest units would appear to be disturbances but would resemble natural patterns. The alternatives would meet the area's Visual Quality Objective of Modification in which management activities may dominate the view, but characteristics of the surrounding landscape are retained.

The most significance difference between Alternative C and the other action alternatives would be viewed from Viewpoint C-7-e. From here, the viewer sees more units in Alternative C than in Alternative B. The size, design, and distribution of the units would be similar to those elsewhere along the southern shoreline of Port Houghton. Unlike the other areas along the southern shoreline, the area viewed from Viewpoint C-7-e (VCU 82) has a Visual Quality Objective of Partial Retention. Alternative C would not meet a Visual Quality Objective of Partial Retention because management activities would not be visually subordinate to the characteristic landscape.

The effects of Alternative D in the Port Houghton viewshed would be generally similar to Alternatives B and C, except that the overall visual effect of the Alternative would be less significant than all other action alternatives. A number of conditions in Alternative D provide visual buffering. Alternative D uses helicopter logging (eliminating the need for roads) and disperses the harvest of approximately the same quantity of timber over a wider area using alternative silvicultural methods (group selection, shelterwood).

Sandborn Canal Viewshed

In the Sandborn Canal Viewshed (Appendix G), small boat users see the project area in the fore-, middle- and background. However, steep viewing angles and foreground trees block extensive views of the project area. Only Alternative E would create changes that would significantly affect the view of the observer. Alternatives B and C would not result in any roads or units in the Sandborn Canal and therefore would not result in any visual change. Alternative D would result in one partial harvest unit in this viewshed. About 75 percent of the cover would be removed from the 15-acre unit (341101 [123]). The timber would be harvested by helicopter, eliminating potential visual impacts created by roads.

In Alternative E, the viewer would see changes from Viewpoints C-10, C-12-a, and C-13 (Appendix G). In C-10 and C-12-a, the visual impact would be tempered by retention of shoreline, foreground trees. The view from C-13 would

be most affected by Alternative E. The tree-covered slopes on either side of the Sandborn Canal channel the viewer's attention to the steep hillside at the end of the waterway. Route 8490, Unit 341107 (139) and Unit 341105 (129) would be very apparent. In this alternative, the viewshed would change from Type I Existing Visual Condition (natural, untouched by human activities) to Type V in which changes in the landscape are strong and would be obvious to the average forest visitor. This would meet the viewshed's Visual Quality Objective of Modification in which management activities may dominate the view, but must retain characteristics of the surrounding landscape. The midslope clearing has an irregular form that responds to topography. However, public comment at the scoping meeting indicates that the Sandborn Canal is a desirable forest visitor location. The proposed harvest in this viewshed may meet the Visual Quality Objectives established by the Forest Service, yet still be of concern to the public.

Inner Port Houghton Viewshed

In the Inner Port Houghton Viewshed (Appendix G), people in small boats see the landform on all shorelines grow steep, substantial, and lofty. The closeness and verticality of slopes causes visual change to be readily apparent, whether in the middleground or background. The Existing Visual Condition is Type I, natural and apparently untouched by human activity. Alternative E would not result in any units or roads in this viewshed and, so, would have the same impact as the no-action alternative. In all other action alternatives, people would see visual change. The effect of the visual change would vary by viewpoint and alternative.

Under Alternatives B and C, People at Viewpoint C-14 (Appendix G) would see the Rabbit Cove LTF, Unit 341118 (30), Route 84934 and Route 84935 in the fore- and middleground. The potential development area for the LTF would be at a higher elevation than the shoreline tree buffer, and viewers would be able to discern the management activities, depending on site-specific layout of facilities. Visual change in this area would be highly apparent because the steep topography creates a "billboard" at the entrance to the Sandborn Canal. Road construction on steep slopes would result in substantial visual disturbance and a sharply-defined, horizontal line in the landscape. Alternative B would alter the visual condition from Type I to Type V in which changes in the landscape are strong and appear to be major disturbances. From this viewpoint, the alternative would result in management activities that would become a focal point when viewed from the middleground distance and, therefore, the alternative would not meet the Visual Quality Objectives of Partial Retention.

In both Alternatives B and C, people at Viewpoint C-16-a and C-16-b (Appendix G) would see the project area in the middle- and background from the small boat route. People would see Units 398119 (24), 398120 (26), 398121 (28), and 398123 (25a) and the roads serving the units. All but Unit 398121 would be at visually prominent locations on the nose of a ridge or on a plane nearly

perpendicular to the viewer. Road construction on steep slopes would result in substantial visual disturbance and a sharply defined, horizontal line in the landscape. At Viewpoint C-16-a (Appendix G), Alternative C would result in viewers seeing substantially more visual change from units and roads. From this viewpoint, both alternatives would alter the visual condition from Type I to Type V. The Visual Quality Objective for most of the viewshed is Modification, which allows that management activities may dominate the view, but must retain characteristics of the surrounding landscape. The combined effect of visually prominent roads and units would not retain characteristics of the surrounding landscape and the alternative would not meet the Modification Visual Quality Objective. Alternative C would be the most visually impacting of the three action alternatives with units in this viewshed.

Alternative D would be the least visually impacting of the three action alternatives with units in this viewshed. Alternative D would have no units or roads that could be viewed from Viewpoint C-14; the impact would be the same as the no-action alternative. Under this alternative, all units in the Inner Port Houghton Viewshed would be harvested by helicopter, eliminating the need for roads. Also, visually prominent units (on the nose of ridges or on a plane nearly perpendicular to the viewer) would be group selection, with removal of about only 25 to 35 percent of existing cover (Appendix G). Alternative D would alter the visual condition from Type I, natural and untouched by human activities, to Type III in which changes are noticed, but the natural appearance of the landscape still remains dominant. Alternative D would meet the Visual Quality Objective of Modification.

Salt Chuck Antechamber Viewshed

The sense of enclosure is strong for the viewer on the small boat route in the Salt Chuck Antechamber (Appendix G) and people can perceive detail on the shoreline. In this viewshed, the mouth of Port Houghton is lost to sight. Alternatives B and E would not result in any units or roads in this viewshed and, so, both would have the same visual impact as the no-action alternative.

In Alternative C, people at Viewpoint C-17-a (Appendix G) would see the North Point LTF, group selection area 398 and Route 8493 and 84931 in the fore- and middleground. The potential development area for the LTF would be at a higher elevation than the shoreline tree buffer. Viewers would be able to discern the management activities, depending on site-specific layout of facilities. The Existing Visual Condition is Type I, natural and apparently untouched by human activities. This alternative would result in a Type V visual condition in which visual changes are strong and would be obvious to the average forest visitor. The Visual Quality Objective for the area where visual changes would occur is Modification, which allows that management activities can dominate the view (activities can even be a focal point in the fore- and middleground), but must retain characteristics of the surrounding landscape. Alternative C would meet this Visual Quality Objective.

However, the Visual Resource Inventory found that the Visual Resource Data Base records the Sensitivity Level for this area as less sensitive, as it should be, given the unique scenic and topographic conditions. If the Sensitivity Level is raised, the Visual Quality Objective could change from Modification to Partial Retention. Alternative C would not meet this Visual Quality Objective in which management activities would remain visually subordinate to the characteristic landscape.

In Alternative D, all units would be harvested by helicopter, eliminating the need for roads. From Viewpoint C-17-a and C-17-b (Appendix G), viewers would see Units 398130 (22) and group selection area 398. In the two units, removal of salvage or overstory would result in alteration to about 25 to 35 percent of visual cover. The resultant visual condition would be Type III in which changes are noticed, but the natural appearance of the landscape still remains dominant. Alternative D would meet the Visual Quality Objective of Modification or Partial Retention.

Salt Chuck Viewshed

None of the action alternatives would result in units or roads in the Salt Chuck Viewshed which has exceptional visual quality. Alternatives B, C, D and E would have the same effect as the no-action alternative.

Summary Comparison of Alternatives

Alternative B generally meets the Visual Quality Objectives in the Port Houghton Viewshed. One area of concern is Unit 321013 (72) and Route 8498 which would be viewed from Robert Island as well as the small boat route. If the unit were eliminated (or partial cut) and the road relocated (or designed to maintain downslope screening trees), Alternative B would meet Visual Quality Objectives.

Alternative C does not meet the Visual Quality Objectives in the Port Houghton Viewshed because it concentrates units in the Partial Retention area in VCU 82. As with Alternative B, modification or elimination of Unit 321013 (72) and Route 8498 would mitigate visual impacts to viewers at Robert Island. Partial cut or elimination of about half of the remaining viewed units in VCU 82 would mitigate visual impacts in the Partial Retention area. This would include Units 321007 (59), 321014 (77), 321015 (85), 321016 (78), and 321020 (176).

In the Inner Port Houghton Viewshed, the greatest visual impacts from Alternative B would result from Units 341118 (30), 398119 (24), 398123 (25), and construction of roads. Alternative C's visual impact results from Units 398125 (27), 398126 (21), and 398128 (23) in addition to the units noted for Alternative B. Also, Alternative C would result in more miles of road. Group selection or similar partial cut methods would help mitigate the impacts resulting from unit harvest. Helicopter logging would eliminate the need for roads which would otherwise create the most significant and long-lasting impact.

Under Alternative C, The North Point LTF, group selection 398, Route 8493, and Route 84931 would result in visual impacts in the Salt Chuck Antechamber Viewshed. Impacts could be mitigated by partial cut methods and helicopter logging. In this area, the road would be generally less impacting than in the Inner Port Houghton Viewshed because it is nestled into the complex topography.

In the Sandborn Canal, Alternative E generally meets the Visual Quality Objectives, but not necessarily public concerns, as expressed at scoping meetings. The area of visual concern includes Route 8490, Unit 341105 (129), and Unit 341107 (139). Partial cut or elimination of the units—especially 341105 (129)—would mitigate visual impacts. The road would be most apparent where it crosses 341105 (129); retaining downslope trees by eliminating 341105 (129) would substantially reduce the visual impact.

Cumulative Effects

Cumulative visual effects result from past and ongoing management activities, proposed activities, and activities that would occur with some certainty in the future. Other visual cumulative effects could include: (1) additional harvesting on private land on Port Houghton; (2) increased numbers of viewers resulting from development of a marine park at Robert Island and growth of tourism in Alaska—particularly whale watching; (3) increased numbers of viewers resulting from development of State-selected land at Whitney Island; and (4) increased recreational opportunities provided by new roads into previously inaccessible areas, resulting in increased numbers of viewers.

The existing clearcut on private land in the Mouth of Port Houghton and Port Houghton viewsheds is highly apparent. Additional harvest on remaining private land would enlarge the clearcut. Because of its large size and prominence, the disturbance created by the clearcut would continue to dominate the visual impression of the landscape even through the period of green up and regeneration (30 to 45 years).

Visual disturbance created by the proposed harvest and road construction activities on public land would contribute to cumulative visual effects. Though clearcut units would take as long as 30 to 45 years to return to a uniform appearance with the surrounding forest, the visual impacts created by the proposed alternatives would diminish much sooner. This is the primarily the result of two factors: (1) small units distributed within a mature forest and (2) a variety of silvicultural methods. The average size of seen units would be relatively small, from 53 to 58 acres. Rather than concentrated in areas, the units would be distributed across the landscape. There is at least a quarter-mile and often a half-mile or greater buffer between adjacent units. A mosaic of color and texture would result from mature forest interspersed with units harvested under a variety of methods including clearcut, partial cut, group selection, overstory removal, and salvage. The mosaic would change over time as regeneration trees in harvest units mature, until uniformity with the surrounding forest is achieved.

The cumulative effects of increased numbers of viewers would heighten the visual sensitivity in all viewsheds within the project area. The Forest Service would have to update the Visual Resource Data Base to reflect this increased use. In future proposed harvests, if any, visual concerns may be greater.

Economics (Issue 12)

Current and future economic development and extraction within the project area are centered on timber, commercial fisheries, and recreation. Effects from timber harvest would result in an overall increase in timber employment and monetary returns, and no overall changes for the fishing and recreation industry, as described below.

Direct and Indirect Effects

Timber

Employment - Direct employment resulting from this timber sale was calculated using 5.44 jobs per million board feet of timber production. Indirect employment was calculated using 3.16 jobs per million board feet of timber production (Morse 1995). Total jobs to be generated from the proposed timber harvest range from 1,011 - 1,072 (Table 4-39). Average total jobs generated is 1,035. Considering a three-year harvest and 345 jobs per year, the number employed represents 7 percent of the average number of jobs (both direct and indirect) in the wood products industry of Southeast Alaska (Lyons 1995). The income generated for each job was estimated using the average wage published in Alaska Department of Labor (1994) for the Technical Occupation Summary sector as $33,751 per year for direct jobs and the Retail Trade sector of $17,376 for indirect jobs. Total income ranges from $27 million to $29 million (Table 4-40). Labor and income are shown for the entire harvest. Harvest would occur over three or more years. Initially, the camp, roads and log transfer facility would be constructed, followed by harvest, and then milling activities. The entire process from commencement to milling of the final log could occur up to 10 years.

Table 4-39
Employment Contributions to Regional Employment During Entire Operations

Alternative	Timber Volume	Direct Jobs	Indirect Jobs	Total
A	0	0	0	0
B	121.5	661	384	1,045
C	116.2	632	367	999
D	120.7	657	381	1,038
E	123.2	670	389	1,059

Source: Barber and Gunther 1995

Table 4-40

Total Income Contributed to Regional Income During Entire Operation

Alternative	Income Generated ($)
A	NA
B	28,981,795
C	27,707,624
D	28,794,663
E	29,372,434

Source: Barber and Gunther 1995

Gross State Product - Gross State Product (GSP) is the total value of goods and services produced by the business activity of a state. The best reflection of this value, for the timber and forest products industry in Southeast Alaska, is the estimated value of the end products produced and sold over a period of time. The Forest Service appraisal procedure for the Tongass National Forest includes the collection of data on the value of the products produced and sold from a thousand board feet of log scale, during recent periods of time. These data were used to compare the contributions to GSP for each alternative. These differ by alternative due to differences in harvest volume levels and the quality and species mix for each alternative. Table 4-41 shows the contribution to GSP for each of the alternatives for the Port Houghton/Cape Fanshaw EIS.

Table 4-41

Contribution to GSP During the Entire Operation of Each Alternative

Alternative	Estimated Volume (net sawlog volume) to be Produced (Million Board Feet)	Estimated End Product Value per Thousand Board Feet	Estimated Contributions to GSP
A	0	NA	NA
B	121.5	$796.00	$96,714,000
C	116.1	$781.00	$90,674,100
D	120.7	$797.00	$96,197,900
E	123.2	$802.00	$98,806,400

Source: Barber and Gunther 1995

The most recent estimate of Alaska's GSP is for 1991 when it was estimated as $26.4 billion dollars (U.S. Bureau of the Census 1994). Using an average of $794 per MBF and the Tongass allowable sale quantity of 450 MMBF, the average total contribution to GSP for the Tongass National Forest is $357,300,000. Alternative D, if harvested in one year, for example, provides 27

percent of the Tongass National Forest's annual contribution to timber GSP. Considering volume and using the 1994 annual timber harvest of 276 MMBF (USDA-FS 1994d), the proposed harvest represents almost 53 percent of this timber volume. The contribution to the State GSP for this timber is less than 1 percent.

Timber Sale Economics - An economic analysis provides a basis of comparison and ranking of the five alternatives proposed for the Port Houghton/Cape Fanshaw project area in economic terms. In this analysis, the net value per MBF for each alternative is derived by subtracting all production costs, including an allowance for profit and risk from the pond value for timber to be harvested.

To account for market functions, a mid-market appraisal was done for each action alternative. This analysis uses weighted average timber values from the first quarter of 1979 through the most recent quarter, and production costs in effect at the time of the Notice of Intent. As a further means of comparison and an indication of present conditions, an analysis using current quarter values and costs was also done.

Table 4-42 summarizes the timber values and costs calculated for each alternative at Port Houghton. Pond log value is the end product selling value minus the manufacturing costs. It is the value of the log delivered to the mill pond for processing. Production costs are those incurred when transporting logs from the stump to the mill. Alternative A, the no-action alternative, is not shown since there is no harvest. The alternative volume shown includes utility and an estimate of the road right-of-way volume that would be cut during road construction. The difference in net value between the alternatives can be attributed to three major factors including: (1) the ratio of road construction to volume, (2) the percentage of high-cost helicopter yarding, and (3) the percentage of higher value species, such as Alaska yellow cedar and Sitka spruce.

Markets for Southeast Alaska timber and wood products normally experience increases and decreases, and the general tendency has been to increase in value at the rate of inflation, plus some real price increase. Also, these values are the average for all the sellers of wood products; that is, they reflect the prices to the seller of average efficiency. Similarly, the cost for logging and processing the timber reflect the recent past experience of the operators of average efficiency. As current analysis results show, the negative mid-market values on some alternatives should not be interpreted to mean that such a timber sale offering would not be sold at the minimum acceptable rates or higher, when offered in the future. The results of the mid-market appraisal are designed as an economic comparison between the alternatives considered.

Alternative E has the highest net stumpage value. Primarily, this is attributable to the reduction in development cost associated with larger volumes of timber to be

Table 4-42

Timber Values and Costs to an Operator of Average Efficiency

	Alternative			
	B	C	D	E
Mid-Market Analysis				
Total Volume (MBF)	121,523	116,232	120,671	123,176
Pond Log Value	$356.91	$341.42	$358.90	$364.66
Logging Costs $/MBF	$257.19	$209.99	$312.03	$207.73
Specified Road $/MBF	$96.79	$136.88	$97.35	$102.16
SUBTOTAL COSTS	**$353.98**	**$346.87**	**$409.38**	**$309.89**
Conversion Return	$2.93	($5.45)	($50.48)	$54.77
60% Profit & Risk	$48.77	$46.40	$48.68	$48.67
NET STUMPAGE VALUE	**($45.84)**	**($51.85)**	**($99.16)**	**$6.10**
Current Quarter Analysis[a]				
Total Volume (MBF)	121,523	116,232	120,671	123,176
Pond Log Value	$524.22	$499.00	$524.74	$541.25
Logging Costs $/MBF	$275.16	$230.88	$328.50	$229.44
Specified Road $/MBF	$96.79	$136.88	$97.35	$102.16
SUBTOTAL COSTS	$371.95	$367.76	$425.85	$331.60
Conversion Return	$152.27	$131.24	$98.89	$209.65
100% Profit & Risk	$88.67	$83.63	$88.44	$89.72
NET STUMPAGE VALUE	$63.60	$47.61	$10.45	$119.93

[a] Base year 1993 adjusted to 1st Quarter 1995
Source: Barber and Gunther 1995

harvested over an area with fewer road miles and lower logging costs. The largest single cost is the construction of specified roads. Road cost per mile would vary between alternatives, due to the difficulty of construction and the number of bridges and other structures in each alternative. These are estimated to have an average cost ranging from $156,000.00 to $170,000.00 per mile.

Alternative E has the lowest production cost (cost associated with harvesting timber) while Alternative D has the highest. For the mid-market analysis, the western hemlock and mountain hemlock have a negative indicated net stumpage on all alternatives; however, the high value of the Sitka spruce and Alaska yellow cedar result in Alternative E having a positive total indicated net stumpage. For the current quarter analysis, all action alternatives have a positive indicated net stumpage. Note that the current analysis uses a 100 percent profit and risk margin, rather than the 60 percent used in the mid-market analysis.

Commercial Fishing Industry

Current standards and guidelines for timber harvest activities are expected to limit adverse effects on fish habitat and fish populations. Jobs in the fishing industry are not expected to change due to implementing any of the project alternatives. Fishers are likely to continue to utilize the project area for commercial fishing unless or until fishing harvest declines are greater than declines reported elsewhere. At that time, fishers would move their operations elsewhere. However, this would occur even under the no-action alternative. Fish population declines are already anticipated due to the change in direction of the subarctic boundary current (USDA-FS 1995b). Any decline in fish populations from the proposed timber harvest would be in addition to the already anticipated decline.

Recreation and Tourism Industry

Recreation and tourism-related jobs, including employment related to sport hunting and fishing, are projected to change at the same rate as future use. During the 1990s recreational use in Southeast Alaska is expected to increase by 27 percent for general recreation and tourism, 36 percent for sport fishing, and 53 percent for hunting (USDA-FS 1991). Implementation of any of the alternatives in the project area is not expected to significantly impact this trend.

Jobs and earnings related to money spent by recreationists are widely dispersed across Southeast Alaska. The recreational users having the primary economic impact in the project area would be individual recreationists, guides, and outfitters and their clients, and tourists viewing the project area from cruise ships or from the Alaska Marine Highway ferry system.

Some places within the project area may be seen by passengers of cruise ships and the Alaska Marine Highway. None of the alternatives is expected to effect visual resources to the extent that alterations of marine transportation routes or a decrease in the numbers of passengers would occur. Consequently, no measurable economic impact to waterborne tourism is expected under any of the proposed alternatives.

The level of recreational activity that takes place in the project area is relatively low by Southeast Alaska standards, most activity is limited to those areas easily accessible by saltwater. In economic terms, no alternative is expected to significantly affect employment and income opportunities in the recreation and tourism industry. Implementation of any of the action alternatives may result in the displacement of recreational users to areas outside the project area. This displacement would be a result of recreationists seeking specific recreation opportunities that might no longer be available due to timber harvest or road construction. As more areas throughout Southeast Alaska are harvested for timber, recreationists seeking primitive or semiprimitive recreational opportunities

would find it increasingly difficult to find places to recreate. This displacement, however, would not be expected to significantly change employment or income.

Cumulative Effects

The proposed harvest would help to increase employment in Southeast Alaska, contribute to regional income and GSP, and likely be sold as a positive contributor to the overall national economy assuming that timber values remain near their current level. Because timber has had historically low values since 1979, the mid market appraisal results in a negative stumpage value for three of the four action alternatives.

An additional cost and side effect from the timber sale is the overall effect on recreation, tourism, and commercial fisheries. Although recreation and tourism opportunities would continue in the project area, the visual and roading effects of the proposed harvest would decrease direct use of the project area by those seeking a primitive experience. This harvest would contribute to the cumulative effects of reduced primitive experiences throughout the Tongass National Forest in other areas proposed for harvest or previously logged or roaded. However, the area is a distant view from the cruise ships traveling in Frederick Sound and Stephens Passage, and is not a frequent use area by other types of recreationists because of its distance from communities and lack of a good navigational map for the project area.

Cumulative effects to commercial fisheries are that more sediment, turbidity, and water quality effects in the project area would likely effect the overall production rate of salmon and cutthroat trout in Southeast Alaska, that, through the migratory patterns of fish, may not be directly observable in the project area.

Other Environmental Considerations

Probable Adverse Environmental Effects that Cannot be Avoided

Implementation of any action alternative may result in some adverse environmental effects that cannot be effectively mitigated or avoided if the project is to take place. The interdisciplinary procedure used to identify specific harvest units and roads was designed to eliminate or lessen the significant adverse consequences. In addition, the application of standards and guidelines, BMPs, mitigation measures, and a monitoring plan are intended to further limit the extent, severity, and duration of these effects. The specific environmental effects of the alternatives were discussed earlier in this chapter, and the proposed mitigation measures are discussed for each alternative in Chapter 2 and Appendix L. Although the formulation of the alternatives included avoidance of potentially adverse environmental effects, some adverse impacts to the environment which cannot be completely mitigated may occur.

Although standards and guidelines, BMPs, and monitoring plans are designed to prevent significant adverse effects to soils and water, the potential for adverse impacts does exist. Sediment production would occur as long as roads are being

built and timber is harvested. Sediment would be produced by surface erosion, channel erosion, and mass movement.

Disturbance, displacement, or loss of fish and wildlife would occur as a consequence of habitat loss and increased human activity in the project area. New road construction and the human activities associated with new access to areas previously unroaded would result in impacts to fish and wildlife. The proposed activities have the potential to increase competition for subsistence resources.

Ground-disturbing activities would temporarily increase sediment loads in some streams. This could displace fish, reduce anadromous and resident fish reproductive success, and alter aquatic invertebrate populations. In addition, a loss of fish habitat would occur at road crossings of streams. The portion of a stream bed occupied by a culvert or other structures would be lost as fish habitat.

Both the amount and distribution of mature and old-growth stands would be reduced through implementation of any action alternative. The rate and severity of adverse impacts varies by alternative. Because some wildlife species rely on habitat conditions provided by old-growth stands, the reduction in the populations of some wildlife species can be expected. As old-growth forest stands are converted to young even-aged stands, the capability of the project area to provide optimal habitat for old-growth dependent species would be reduced.

Timber harvest and road construction in areas that are currently unroaded would alter natural characteristics of these areas. This would modify the recreational experiences that are offered by these areas. Both Primitive and Semiprimitive recreational opportunities would be lost by these actions. In addition, these development activities would result in a loss of opportunity to consider these areas in future revisions of the Forest Plan, for designation as wilderness, as research natural areas, or for other purposes requiring natural characteristics.

The natural landscape would appear visually altered by timber harvest, particularly where logging activity is highly visible from travel routes. These adverse effects would eventually be reduced by growth of vegetation. Other impacts on the natural appearance of the landscape include roads and structures which are highly visible despite efforts to blend them with land forms and mitigate the effect by landscaping.

The intensity and duration of these effects depends on the alternative and the mitigation measures applied to protect the resources. Some unavoidable effects relative to fisheries are expected to be short term (usually less than ten years). However, other unavoidable adverse impacts are long-term, occurring for many years.

One of the most significant adverse impacts that affects most resources is the loss of old-growth forest. This vegetation alteration results in changes to wildlife species richness and abundance wherever harvesting occurs. Species dependent on old-growth would no longer utilize areas harvested. A return to old-growth forested ecosystems generally would require a minimum of 200 years. Affects on biodiversity are difficult to quantify for single harvest within the project area. These types of impacts are best understood and treated on a landscape basis, and thus would become most apparent only after effects are cumulative over several harvest entries. In all cases, the effects would be managed to comply with established legal limits, such as a maximum time for regeneration. To check and reduce these effects, monitoring procedures and mitigation measures have been planned for those areas which may be affected. Certain monitoring procedures and mitigation measures are required by existing standards or guidelines.

Relationship Between Short-term Uses and Long-term Productivity

Maintaining the productivity of the land is a complex, long-term objective. All alternatives were designed to protect the long-term productivity of the project area through the use of specific standards and guidelines, mitigative measures, and BMPs. Long-term productivity could change as a result of various management activities proposed in the alternatives. Timber management activities would have direct, indirect, and cumulative effects on the economic, social, and biological environment.

All alternatives would come under the mandate of the Multiple Use and Sustained Yield Act of 1960, which requires the Forest Service to manage National Forest lands for multiple uses, including timber, recreation, fish and wildlife, range, and watershed. All renewable resources are to be managed such that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be reestablished and grow again if the productivity of the land is not impaired.

Timber harvest results in the creation of new timber stands and increased growth rates. Old-growth forests are characterized by low or no net growth with annual growth being offset by mortality (Hutchison and Lebau 1975). The replacement of young, second-growth stands could double the volume growth produced over a 100-year-old rotation on an average site (Taylor 1934). In areas that would be precommercially thinned, the amount of usable fiber available for industrial use would be increased.

Under current and proposed management direction, the time between the harvest proposed for the Port Houghton/Cape Fanshaw EIS and a subsequent harvest on the same area is estimated at approximately 100 years. After 100 years, these cut stands would be considered for another harvest. Long-term productivity is not expected to be affected from repeated harvest cuts on 100-year rotations.

Short-term use would result in sediment and temperature related impacts to streams. Revegetation of harvest areas over time should significantly reduce these impacts so that long-term productivity is unaffected. Permanent roads would contribute some sediment over time, and could have a small impact on long-term productivity of fish resources.

Soil and water are two key factors in ecosystem productivity, and these resources would be protected in all alternatives to avoid damage that could take many decades to rectify. Sustained yield of timber, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. Quality and quantity of water from the project area may fluctuate as a result of short-term uses, but no long-term effects to the water resource are expected to occur as a result of timber management activities.

All alternatives would provide the fish and wildlife habitat necessary to maintain existing known populations of native and nonnative species throughout the project area. The acreage to be harvested is less than ten percent of the project area. Wildlife species richness and abundance also depend on the quality, quantity, and distribution of habitat, whether used for breeding, feeding, or resting. The standards, guidelines, and mitigative measures that would be implemented for the proposed harvest would maintain long-term habitat and species productivity.

The harvesting of forest land is a trade-off between the immediate, short-term extraction and use of timber and long-term biodiversity of unharvested old-growth forest. Because there is a relatively small proportion of the landscape that is subject to proposed harvesting in the project area, only a correspondingly small loss of long-term biodiversity would be associated with the short-term extraction of timber. These trade-offs would become significant only if the cumulative effects of several harvest entries into the project area and surrounding areas result in substantially greater fragmentation of old-growth habitat.

Subsistence resources would be affected in the short-term through loss or alteration of some wildlife habitat, and degradation of water and air quality. Revegetation harvested areas and the completion of logging activities should significantly reduce the possibility of long-term effects to productivity. Permanent roads may provide improved access, which has the remote possibility for a long-term increase in competition for subsistence resources.

Irreversible and Irretrievable Commitment of Resources

Irreversible commitments of resources are decisions to use, modify, or otherwise affect nonrenewable resources such as cultural resources or minerals. Irreversible commitments could also apply to resources that are renewable only over a long period of time such as soils productivity or old-growth forests. Such commitments of resources are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense, or the resource has been destroyed or removed. All

alternatives result in some irreversible commitments, although the extent and potential for adverse effects increase in alternatives that emphasize resource extraction and utilization.

Irretrievable commitments represent opportunities foregone for the period of the proposed actions, during which other resource utilization cannot be realized. These decisions are reversible, but the lost opportunities for utilization are irretrievable. Under multiple-use management, some irretrievable commitments of resources are unavoidable due to the mutually exclusive relationship between some resources. An example of such a commitment is development at logging camps that would be removed at the completion of logging activities. These developments occupy of to 20 acres, and include bunkhouses, mobile homes, fuel storage facilities, etc. For the 3 to 5 years that such developments exist, the opportunity to otherwise utilize these areas is foregone, thus irretrievable.

A proposed timber harvest is major, long-term commitment of resources such as wildlife habitat, that extends in time well beyond the typical land-use planning time-frame. Harvesting of old-growth timber is considered an irreversible loss, because stands may take up to 200 to 300 years to return to existing ecosystem conditions. Some wildlife, adapted only to old-growth conditions, would be irreversibly lost from the harvested areas until this time. Permanent road construction would also result in irreversible loss of wildlife habitat.

In addition to loss of wildlife habitat, permanent road construction would result in loss of wetlands and an irreversible change in the accessibility of fish and subsistence resources. Soil productivity would be eliminated in landings and rockpits.

Irreversible disturbance of some types of cultural resources may occur as a consequence of management activities. This would be especially true for subsurface resources that cannot be located through surface surveys. Even with mitigation, unanticipated or unavoidable disturbances can result in the loss of cultural values. Mitigation efforts such as data recovery involve the scientific and controlled destruction of a cultural resource site. Once undertaken, the effects are irreversible and the mitigation effort becomes an irretrievable commitment to the resource.

The use of energy resources and the removal of mineral resources are irreversible commitments of resources. The utilization of rock resources for road and facility construction would be an example. The use of fossil fuels during project administration activities would be an irreversible resource commitment. Alternatives vary by the amount of energy and mineral resources used; only the no-action alternative abstains from the use of these nonrenewable resources at this time.

In unroaded areas, development activities such as timber harvest and the road construction associated with harvest would irreversibly reduce the potential mount of area that could be designated as a part of the National Wilderness Preservation system, managed as a Research Natural Area, or managed for other purposes requiring natural characteristics.

In the short-term, recreation experiences would be directly affected by road construction and timber harvesting, including the presence of heavy equipment in the area. Over time, as the harvest units revegetate and the modification of the landscape becomes less evident to visitors, roaded modified opportunities would be replaced by semi-primitive motorized recreation opportunities. Construction of permanent roads would contribute to long-term public access into the area for recreation.

The majority of the project area is currently viewed as roadless, unmodified landscape where only ecological change occurs. Introduction of harvest units, roads, and rockpits would permanently alter the undeveloped character and old-growth qualities. Green-up of harvested land would occur over time, and visual contrasts would begin to soften in five years, with an eventual return to old-growth forest in 200 years. Most of the proposed road miles, and rockpits would result in permanent alterations to the existing unmodified landscape.

Possible Conflicts with Plans and Policies of Other Jurisdictions

The regulations for implementing NEPA require a determination of possible conflicts between the proposed action and the objectives of federal, state, and local land use plan, policies, and controls for the area. The major land use regulations of concern are the Coastal Zone Management Act (CZMA), Section 810 of ANILCA, the Federal Clean Water Act, state air pollution standards, and the State of Alaska's Forest Practices Act. A discussion of each of these determinations is presented below.

Coastal Zone Management Act of 1976 (CZMA)

The CZMA was passed by Congress in 1976 and amended in 1990. This law, as amended, requires Federal agencies conducting activities or undertaking development affecting the coastal zone to ensure that the activities or developments are consistent with approved State coastal management programs to the maximum extent practicable. The State of Alaska passed the Alaska Coastal Management Act in 1977 to establish a program that meets the requirements of the CZMA. It contains the standards and criteria for a determination of consistency for activities within the coastal zone.

Standards against which the consistency evaluation takes place are: Alaska Statute Title 46, Water, Air Energy, and Environmental Conservation; Alaska Forest Practices Act of 1990; and the District Coastal Management Program.

The Forest Service has evaluated the alternatives to ensure that the activities and developments affecting the coastal zone are consistent with the enforceable policies of the approved State management program to the maximum extent practicable. The standards and guidelines for timber management activities in the Port Houghton/Cape Fanshaw project area meet or exceed those indicated in the Alaska Forest Practices Act and the Alaska Coastal Management Program.

Evaluation of the proposed activities against enforceable policies for activities within the coastal zone results in a finding that these activities are consistent with the Alaska Coastal Management Program to the greatest extent practicable. The State of Alaska Office of Governmental Coordination will do a consistency review of the proposed activities.

Recission Bill of 1995

On July 27, 1995, Congress enacted a federal budget recission law that had provisions regarding habitat conservation areas and protective zones around goshawk nests in the Tongass National Forest. All alternatives are consistent with the language in Public Law 104-19, Section 502.

Alaska National Interest Lands Conservation Act of 1980 (ANILCA)

Under Section 810 of ANILCA, agencies are required to evaluate the effects of proposed actions on subsistence uses of Federal land and to determine if the proposed action may significantly restrict subsistence opportunities. Refer to the *Subsistence* section of this chapter for the evaluation of impacts to subsistence use as a result of the alternatives.

Clean Water Act

Federal Clean Water Act of 1972, as amended in 1977 and the MOU signed between the Forest Service and the Alaska Department of Environmental Conservation, require the Forest Service to comply with all Federal and State water quality regulations. This act provides a means to protect and improve the quality of the water resources and maintain their beneficial uses. All alternatives will comply with these standards.

Air Quality Standards

The project area is governed by ambient particulate standards of 60 $\mu g/m^3$(24-hr). Additionally, the region is classified as a Class II area, which establishes a particulate matter increment for allowable increases above baseline levels. The increments for particulate matter in a Class II area are in annual geometric mean of 19 $\mu g/m^3$. The project area is presently in compliance with these standards. The proposed logging activity would not change this status.

State of Alaska's Forest Practices Act of 1990

On May 11, 1990, Governor Cowper approved the legislature's major revision of the State's Forest Practices Act (FPA). The revised act significantly increases the State's role in providing protection and management for important forest resources on State and private lands. The revised Forest Practices Act would also affect National Forest management through its relationship to the ACMP and the Federal CZMA (see above discussion).

For National Forest timber operations, such as proposed for the project area, the effect of the revised Forest Practices Act is essentially two-fold. First, it clarifies that the revised Forest Practices Act is the standard which must be used for evaluating timber harvest activities on Federal lands for purposes of determining consistency to the maximum extent practicable with the Alaska Coastal Zone Management Program. Secondly, it calls for minimum 66-ft buffers on all Class I streams, and recognizes that consistency to other maximum extent possible for purposes of the Alaska Coastal Management Program is attainable in Federal timber harvest activities using specific methodologies which may differ from those required by the revised Forest Practices Act or its implementing regulations.

The TTRA prohibited commercial timber harvesting with buffer zones established on all Class I streams and those Class II streams which flow directly into a Class I stream. Buffer zones have a minimum width of 100-ft slope distance from the edge of either side of the stream.

Energy Requirements and Conservation Potential of Alternatives

The implementation of the proposed actions in the Port Houghton/Cape Fanshaw area will require the expenditure of energy (e.g., fuel consumption). The amount of energy used varies by alternative based on timber volume harvested and miles of road constructed. The direct effect of the alternatives on energy requirements would be attributed to timber harvest, road construction, and travel necessary to administer the timber sale. Indirect energy requirements include processing wood products and the transport of the products to secondary processors and consumers. The estimated total fuel consumption required for each alternative is displayed in Table 4-43.

Natural or Depletable Resource Requirements and Conservation of Alternatives

All alternatives considered in detail are designed to conform to applicable laws and regulations pertaining to natural or depletable resources, including minerals and energy resources. Regulation of mineral and energy activities on the National Forest, under the U.S. Mining Laws Act of May 1872 and the Mineral Leasing Act of February 1920, is shared with the USBLM. The demand for access to National Forest lands for the purpose of mineral and energy exploration and development is expected to increase over time.

Table 4-43

Estimated Fuel Consumption (Gallons)

	Alternative			
Activity	B	C	D	E
Preparation and Administration (1.56 gallons/MBF)	189,575	181,323	188,247	192,155
Logging and Transportation (14.8 gallons/MBF)	1,798,540	1,720,248	1,785,931	1,823,005
Road Construction and Maintenance (4,000 gallons/mile)	298,800	376,400	277,600	318,000
Total Consumption	2,286,915	2,277,971	2,251,777	2,333,160

Note: The estimated fuel consumption for timber harvest activities is based on consumption per MBF of sawlog volume.

The action alternatives propose road construction that would increase opportunities for access to the National Forest within the project area. This increased access may result in increased activity with regard to potential mineral or energy resource occurrences.

Urban Quality, Historic and Cultural Resources, and the Design of the Built Environment

The project area contains no urban areas or built-up areas of any kind. Therefore, the only applicable concern under this topic is with historic and cultural resources. The goal of the Forest Service's Cultural Resource Management Program is to preserve significant cultural resources in their field setting and ensure they remain available in the future for research, social/cultural purposes, recreation, and education. There are adequate standards, guidelines, and procedures to protect cultural resources and to meet the goals of the Cultural Resource Management program. Cultural resources and the proposed project design are discussed in the *Cultural Resources* section of this chapter.

Effects of Alternatives on Consumers, Civil Rights, Minorities, and Women

All Forest Service actions have the potential to produce some form of impacts, positive and/or negative, on the civil rights of individuals or groups, including minorities and women. The need to conduct an analysis of the potential impact is required by Forest Service manual and Handbook direction. The purpose of the impact analysis is to determine the scope, intensity, duration, and direction of impacts resulting from a proposed action. For environmental or natural resource actions as proposed for the project, the civil rights impact analysis is an integral part of the procedures and the variables associated with the social impact analysis.

The effect of the alternatives on consumers is reflected in the discussion of the various goods and services supplied as a result of the proposed actions. This analysis occurs throughout this chapter as an integral part of the analysis pertinent

to the effects on minorities as part of the cultural resource, economics, and subsistence sections.

Effects of Alternatives on Prime Farm Land, Rangeland, and Forest Land

All alternatives are in keeping with the intent of Secretary of Agriculture Memorandum 1827 for prime land. The project area does not contain any prime farm lands or rangelands. Prime forest land does not apply to lands within the National Forest system. In all alternatives, lands administered by the Forest Service would be managed with a sensitivity to the effects on adjacent lands.

Effects of Alternatives on Threatened and Endangered Species, and Critical Habitat

There will be no adverse impacts to any Federally listed threatened and endangered species or critical habitat as a result of this project. The discussion of the effects of the alternatives on threatened and endangered species is presented in the *Wildlife* section of this chapter.

Chapter 5

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Chapter 6

Glossary

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Glossary

Access
The opportunity to approach, enter, and make use of public lands.

Access Management
Acquiring rights and developing and maintaining facilities needed by people to get to and move through public lands.

Alaska National Interest Lands Conservation Act (ANILCA)
Passed by Congress in 1980, this legislation designated 14 National Forest wilderness areas in Southeast Alaska. Section 810 requires evaluations of subsistence impacts before changing the use of these lands.

Alaska Native Claims Settlement Act (ANCSA)
Approved December 18, 1971, ANCSA provides for the settlement of certain land claims of Alaska natives and for other purposes.

Allowable Sale Quantity (ASQ)
ASQ refers to the maximum quantity of timber that may be sold each decade from the Tongass National Forest. This quantity, expressed as a board foot measure, is calculated per timber utilization standards specified in the Alaska Regional Guide, the number and type of acres available for timber management, and the intensity of timber management. The ASQ was calculated at 4.5 billion board feet per decade for the Tongass National Forest.

All-Terrain Vehicle (ATV)
A wheeled vehicle less than 40 inches wide.

Alpine
Parts of mountains above tree growth and/or the organisms living there.

Alternative
One of several policies, plans, or projects proposed for decision making.

Anadromous Fish
Fish species that spend part of their lives in fresh water and part of their lives in salt water. Anadromous fish include pink, chum, coho, sockeye, and king salmon, and steelhead trout. There are also anadromous Dolly Varden char.

6 Glossary

Aquatic Habitat Management Unit (AHMU)
A mapping unit that displays an identified value for aquatic resources. It is a mechanism for carrying out aquatic resource management policy.

> *Class I AHMU*: Streams with anadromous or high-quality sport fish habitat. Also included is the habitat upstream from a migration barrier known to have reasonable enhancement opportunities for anadromous fish.
>
> *Class II AHMU*: Streams with resident fish populations and generally steep (6 to 15 percent) gradient (can also include streams from 0 to 6 percent gradient where no anadromous fish occur). These populations have limited sport fisheries values and are separate from the high-quality sport fishing systems included in Class I. They generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use.
>
> *Class III AHMU*: Streams with no fish populations but which have potential water quality influence on the downstream aquatic habitat.

Background
The distance part of a landscape. The seen or viewed area located from 3 to 5 miles to infinity from the viewer. See also Foreground and Middleground.

Beach Fringe Habitat
Habitat that occurs from the intertidal zone inland 500 feet, and islands of less than 50 acres.

Best Management Practice (BMP)
Practices used for the protection of water quality. BMPs are designed to prevent or reduce the pollution from nonpoint sources or other adverse water quality impacts while meeting other goals and objectives. BMPs are standards to be achieved, not detailed or site-specific prescriptions or solutions. BMPs, as defined in the USDA Forest Service Soil and Water Conservation Handbook, are mandated for use in Region 10 under the Tongass Timber Reform Act.

Biological Diversity (Biodiversity)
The variety of life in all its forms and at all levels. This includes the various kinds and combinations of: genes; species of plants, animals, and microorganisms; populations; communities; and ecosystems. It also includes the physical and ecological processes that allow all levels to interact and survive. The most familiar level of biological diversity is the species level, which is the number and abundance of plants, animals, and microorganisms.

Blowdown
See windthrow.

Bogs, Fens, and Peatlands
A tract of low, marshy ground consisting of organic terrain, relatively rich in mineral salts. The area is typically undrained or imperfectly drained with a vegetation complex composed of sedges, shrubs, and sphagnum mosses, typically with peat formation.

Buffer
The Tongass Timber Reform Act requires that timber harvest be prohibited in an area no less than 100 feet of uncut timber in width on each side of all Class I streams and Class II streams which flow directly into Class I streams. This 100-foot-wide area is know as a buffer.

Candidate Species
Those species of plant or animal that are under consideration (by U.S. Fish and Wildlife Service and National Marine Fisheries Service) for listing as threatened or endangered but which are provided no statutory protection under the Endangered Species Act.

Capability
An evaluation of a resource's inherent potential for use.

Carrying Capacity
The maximum number of species that can be supported indefinitely by available resources in a given area.

Cave
Any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge and which is large enough to permit an individual to enter.

Cave Resources
Any material or substance occurring in caves on Federal lands, such as animal life, plant life, paleontological resources, cultural resources, sediments, minerals, speleogens, and speleothems.

Channel Migration
Movement of a stream or river channel within a floodplain area, usually over an extended period of time.

Channel Types
The defining of stream sections based on watershed runoff, landform relief, and geology.

Class I, II, III Streams
See Aquatic Habitat Management Units.

6 Glossary

Clearcut
The harvesting in one cut of all trees on an area. The area harvested may be a patch, strip, or stand large enough to be mapped or recorded as a separate class in planning for sustained yield. Clearcut size on the Tongass National Forest is limited to 100 acres, except for specific conditions noted in the Alaska Regional Guide.

Clearcut with Reserves
Harvesting in one cut area with some trees remaining within the cut area. Reserve trees are either green culls or snags. The amount remaining is less than 10 percent of the net MBF for the entire unit. This method resembles the seed tree method, but the reserve trees are generally not relied on to regenerate the site. Rather the reserve trees are used to mitigate soils, wildlife, and visual concerns.

Climax
A community of plants and animals which is relatively stable over time and which represents the late stages of succession under the current climate and soil conditions.

Commercial Forest Land
Productive forest land that is producing or capable of producing continuous crops of industrial wood and is not withdrawn from timber use by statute or administrative regulation. This includes areas suitable for management and generally capable of producing in excess of 20 cubic feet per acre of annual growth or in excess of 8,000 board feet net volume per acre. It includes accessible and inaccessible areas.

Commercial Thinning
Thinning a stand where the trees to be removed are large enough to sell.

Corridor
Connective links of certain types of vegetation between patches of suitable habitat which are necessary for certain species to facilitate movement of individuals between patches of suitable habitat. Also refers to transportation or utility right-of-way.

Cover
Refers to trees, shrubs, or other landscape features that allow an animal to partially or fully conceal itself.

Critical Habitat
Specific terrain within the geographical area occupied by threatened or endangered species. Physical and biological features that are essential to conservation of the species and which may require special management considerations or protection are found in these areas.

Crown
The tree canopy. The upper part of a tree or woody plant that carries the main branch system and foliage.

Cull Logs
Trees that do not meet certain quality specifications.

Culturally Modified Tree (CMT)
A tree which has been intentionally altered by Native people participating in the traditional use of the forest.

Cultural Resource Sensitivity Zones
Areas determined by a Tongass National Forest predictive model to have high, medium, and low site potential, based largely on elevation and slope angle criteria.

Cultural Resources
Historic or prehistoric objects, sites, buildings, structures, etc., that result from past human activities.

Cumulative Effects
The impacts on the environment resulting from the addition of the incremental impacts of past, present, and reasonably foreseeable future actions regardless of what agency (Federal or nonFederal) or person undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

Debris Avalanche
The sudden movement downslope of the soil mantle; it occurs on steep slopes and is caused by the complete saturation of the soil from prolonged, heavy rains.

Debris Flow
A general term for all types of rapid movement of debris downslope.

Deer Winter Range
Locations that provide food and shelter for Sitka black-tailed deer under moderately severe to severe winter conditions.

Developed Recreation
Recreation that requires facilities that, in turn, result in concentrated use of an area, such as campgrounds and ski areas. Facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water, ski lifts, and buildings. See also Dispersed Recreation.

Diameter at Breast Height (dbh)
The diameter of a tree measured 4 feet 6 inches from the ground.

Direct Employment
The jobs that are immediately associated with the timber sale including, for example, logging, sawmills and pulp mills.

Directional Falling
The use of specialized equipment, such as hydraulic jacks, to influence the direction of tree falling.

Discount Rate
The rate used to adjust future benefits or costs to their present value.

Dispersed Recreation
Recreational activities that are not confined to a specific place and are generally outside developed recreation sites. This includes activities such as scenic driving, hiking, backpacking, hunting, fishing, snowmobiling, horseback riding, cross-country skiing, and recreation in primitive environments. See also Developed Recreation.

Distance Zone
Areas of landscapes denoted by specified distances from the observer (foreground, middleground, or background). Used as a frame of reference in which to discuss landscape characteristics of management activities.

Diversity
The distribution and abundance of different plant and animal communities and species within the area controlled by the Forest Plan.

Down
A tree or portion of a tree that is dead and laying on the ground.

Draft Environmental Impact Statement
A statement of environmental effects, for a major Federal action, which is released to the public and other agencies for comment and review prior to a final management decision. Required by Section 102 of the National Environmental Policy Act (NEPA).

Eagle Nest Tree Buffer Zone
A 330-foot radius around eagle nest trees established in a Memorandum of Understanding between the U.S. Fish and Wildlife Service and the Forest Service.

Ecosystem
A community of organisms and its physical setting. An ecosystem, whether a fallen log or an entire watershed, includes resident organisms, nonliving

components such as soil nutrients, inputs such as rainfall, and outputs such as organisms that disperse to other ecosystems.

Effects
Effects, impacts, and consequences as used in this EIS are synonymous. Effects may be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, or social and may be direct, indirect, or cumulative.

Direct Effects: Results of an action occurring when and where the action takes place.

Indirect Effects: Results of an action occurring at a location other than where the action takes place and/or later in time, but in the reasonably foreseeable future.

Cumulative Effects: See Cumulative Effects.

Encumbrance
A claim, lien, charge, or liability attached to and binding real property.

Endangered Species
A species of plant or animal which is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act. See also Threatened Species, Sensitive Species.

Environmental Analysis
A comprehensive evaluation of alternative actions and their predictable short-term and long-term environmental effects, which include physical, biological, economic, social, and environmental design factors and their interactions. An EA is less comprehensive than an EIS, and may result in a Finding of No Significant Impact. Should the EA reveal significant impacts, a full EIS must then be conducted.

Erosion
The wearing away of the land surface by running water, wind, ice, gravity, or other geological activities.

Escapement
Adult anadromous fish that escape from all causes of mortality (human-caused or natural) to return to streams to spawn.

Estuarine Fringe Habitat
A 1,000-foot zone around an estuary.

Estuary
For the purpose of this EIS process, estuary refers to the relatively flat intertidal and upland areas generally found at the heads of bays and mouths of streams. They are predominantly mud and grass flats and are unforested except for scattered spruce or cottonwood.

Even-Aged Management
Management that results in the creation of stands in which trees of essentially the same age grow together. Clearcut, shelterwood, and other tree-cutting methods produce even-aged stands. See also Uneven-Aged Management.

Existing Visual Condition (EVC)
The level of visual quality or condition presently occurring on the ground. The six existing visual condition categories are:

Type I: These areas appear to be untouched by human activities.

Type II: Areas in which changes in the landscape are not noticed by the average person unless pointed out.

Type III: Areas in which changes in the landscape are noticed by the average person but they do not attract attention. The natural appearance of the landscape still remains dominant.

Type IV: Areas in which changes in the landscape are easily noticed by the average person and may attract some attention. Although the change in landscape is noticeable, it may resemble a natural disturbance.

Type V: Areas in which changes in the landscape are obvious to the average person. These changes appear to be major disturbances.

Type VI: Areas in which changes in the landscape are in glaring contrast to the natural landscape. The changes appear to be drastic disturbances.

Final Environmental Impact Statement (FEIS or Final EIS)
The final version of the statement of environmental effects required for major federal actions under Section 102 of the National Environmental Policy Act. It is a revision of the Draft EIS that includes public and agency responses to the draft. The decision maker chooses which alternatives to select from the Final EIS, and subsequently issues a Record of Decision (ROD).

Fish Habitat
The aquatic environment and the immediately surrounding terrestrial environment that, combined, afford the necessary physical and biological support systems required by fish species during various life stages.

Fish Timing
A mitigation measure that restricts construction activities within an anadromous fish stream to minimize impacts on fish eggs, fry, and migrating salmonids. The normal period during which construction is permitted in fish streams is May 15 to August 20.

Floodplain
The lowland and relatively flat areas joining inland and coastal waters, including debris cones and flood-prone areas of offshore islands; including, at a minimum, that area subject to a 1 percent (100-year recurrence) or greater chance of flooding in any given year.

Forbs
Any herb that is not a grass or is not grasslike.

Foreground
The stand of trees immediately adjacent to a scenic area, recreation facility, or forest highway; the area located less than ¼ mile from the viewer. See also Background and Middleground.

Forested Habitat
All areas with forest cover. Used in this EIS to represent a general habitat zone.

Forested Wetland
A wetland whose vegetation is characterized by an overstory of trees that are 20 feet or taller.

Forest Supervisor
The Forest Service officer responsible for administering a single national forest. The office of the Forest Supervisor for the Chatham Area of the Tongass National Forest is located in Sitka, Alaska.

FSH
Forest Service Handbook.

FSM
Forest Service Manual

Geographic Information System (GIS)
An information processing technology to input, store, manipulate, analyze, and display spatial and attribute data to support the decision-making process. It is a system of computer maps with corresponding site-specific information that can be electronically combined to provide reports and maps.

Geomorphology
The study of the forms of the land surface and the processes producing them. Also the study of the underlying rocks or parent materials and the landforms present that were formed in geological time.

Goshawk Management Areas
Management areas designated for protection of goshawk nests and foraging areas.

Nest Area. The nest, nest tree, and approximately 20-30 forested acres surrounding the nest tree that includes prey-handling areas, perches, and roosts. Stand structure provides trees to support nest structures, a stable micro-environment, and protection from predators.

Post-Fledgling Area. An area surrounding the nest area where fledged young goshawks concentrate their activities until no longer dependent on adults for food. The area is generally 600 acres and includes the nesting area, hiding cover, prey species, and foraging opportunities for young goshawks.

Foraging Area. The area used by young and adult goshawks to meet their food requirements. Foraging areas are about 6,000 acres. The goshawk is an opportunistic forager and the foraging area may contain a mosaic of habitat types. At least 20 percent is in forest stands which meet the most important (i.e., generally Volume Class 5 and higher) or moderately important (i.e., Volume Class 4) habitat structure.

Group Selection
Uneven-aged management of either a forest or specific stand within the forest. A group is similar to a forest gap, less than stand size but larger than the area occupied by a single tree. Group selection of trees for cutting considers groups up to about 2 acres. About 25 percent of net scribner volume of the stand or forest is removed at each entry which occurs over approximately 30-year periods.

Guidelines
A preferred or advisable course of action or level of attainment designed to promote achievement of goals and objectives.

Habitat
The sum total of environmental conditions of a specific place that is occupied by an organism, population, or community of plants or animals.

Habitat Capability
The number of healthy animals that a habitat can sustain.

Habitat Conservation Areas (HCAs)

Habitat Conservation areas were a concept initially recommended by an Interagency Viable Population Committee (Suring et al. 1993) as a means of maintaining old-growth habitat to support viable populations of old-growth dependent wildlife.

Section 502(A) of the 1995 Recission Bill (PL 104-19, signed July 1995) directs that no funds are to be used to implement HCAs for species that have not been declared Threatened or Endangered, except that there may be Goshawk HCAs not to exceed 300 acres per active nest.

HCAs were tracts of suitable, old-growth forest habitat spaced across the landscape to maintain habitat for reproductive individuals of specific wildlife species in each tract and allow interaction of populations among tracts.

Small Habitat Conservation Areas. Small HCAs are maintained to provide temporary functional habitat for animals dispersing between Large and Medium HCAs and to ensure that species of concern have a relatively high likelihood of occurring in each 10,000+ acre watershed. Small HCAs also contribute to the landscape matrix between Large and Medium HCAs. A Small HCA is estimated to include at least 800 acres of old-growth forest having over 8 MBF per acre within an area of at least 1,600 acres.

Medium Habitat Conservation Areas. Medium HCAs encompass at least 5,000 acres of old-growth forest with over 8 MBF per acre, including at least 2,500 acres of old-growth forest with over 20,000 MBF per acre, within an area of at least 10,000 acres to meet the minimum habitat requirements of martens and goshawks.

Large Habitat Conservation Areas. A tract that includes at least 20,000 acres of old-growth with over 8 MBF per acre, including at least 10,000 acres with over 20 MBF per acre, and at least one Class I anadromous fish stream within a total area of at least 40,000 acres.

Habitat Improvement
Management of wildlife and fish habitat to increase their capability.

Hard Snags/Soft Snags
Hard snags are dead trees which have little decay and are generally still hard wood. Soft snags are dead trees which have considerable decay and are generally soft, broken wood.

Haul Out
An area of large, smooth rocks used by seals and sea lions for resting and pupping.

Indicator Species
See Management Indicator Species.

Indirect Employment
The jobs in service industries that are associated with a timber sale, including, for example, suppliers of logging and milling equipment. See also Direct Employment.

Interdisciplinary (ID) Team
A group of people with different backgrounds who are assembled to research, analyze, and write a project EIS. The team is formed out of the recognition that no one scientific discipline is sufficiently broad to adequately analyze a proposed action and its alternatives.

Intermittent Roads
A road developed and operated for periodic service and closed for more than one year between periods of use.

Irretrievable Commitments
Loss of production or use of renewable natural resources for a period of time. For example, timber production from an area is irretrievably lost during the time an area is allocated to a no-harvest prescription; if the allocation is changed to allow timber harvest, timber production can be resumed. The production lost is irretrievable, but not irreversible.

Irreversible Commitments
Decisions causing changes that cannot be reversed. For example, if a roadless area is allocated to allow timber harvest, and timber is actually harvested, that area cannot at a later time be allocated to wilderness. Once harvested, the ability of the area to meet wilderness criteria has been irreversibly lost. Often applies to nonrenewable resources such as mineral and cultural resources.

Issue
A point, matter, or section of public discussion of interest to be addressed or decided.

Karst
A type of topography that develops in areas underlain by soluble rocks, primarily limestones. Sinkholes, collapsed channels, vertical shafts, and caves are formed when the subsurface layer dissolves. Areas on which karst has developed are said to display "karst topography."

Knutsen-Vandenberg Act (KV)
An Act was passed by Congress in 1930 and amended in 1976 to provide for restoration, resource protection, and improvement projects in timber sale areas from funds collected as a portion of the stumpage fee paid by the purchaser. Examples of such projects are stream bank stabilization, fish passage structures, and wildlife habitat improvement.

Krummholz
A physiognomic modification to plants of high elevation areas caused by physical and desecration damage by wind and blowing ice crystals. Vegetation is stunted; twisted and shaped by the blowing winds and snow. The krummholz zone is typically of higher elevation than subalpine forest fringe but below alpine tundra.

Large Woody Debris (LWD)
Any large piece of relatively stable woody material having at least a diameter of greater than 10 centimeters and a length greater than one meter that intrudes into the stream channel.

Layout
Planning and mapping (using aerial photos) of harvest and road systems needed for total harvest of a given area. Also can refer to the process of on ground designation of roads and harvest units.

Logging Systems

Highlead: A cable yarding system, using a two-drum yarder, in which lead blocks are hung on a spar or tower to provide lift to the front end of the logs.

Aerial Logging Systems: Systems where the cut logs are moved from the stump to the loading area or log deck without touching the ground typically utilizing a helicopter.

Live Skyline/Gravity Carriage Return: A two-drum, live skyline yarding system in which the carriage moves down the skyline by gravity; thus, it is restricted tophill yarding. The skyline is lowered to attach logs then raised and pulled to the landing by the mainline.

Live Skyline/Haulback Required: A live skyline yarding system composed of skyline, mainline, and haulback; the carriage is pulled to the woods by the haulback; the skyline is lowered to permit the chokers to be attached to the carriage, and the turn is brought to the landing by the mainline.

Logging Systems and Transportation Analysis (LSTA)
The LSTA is a map that displays all tentatively suitable timber formed into logical settings; the landings for and the logging system assigned to each setting; and the road system(s) to access all settings, exclusive of those for which helicopter

yarding is proposed. Aerial photo interpretation, use of contour maps, and ground verification are used for plan development. The term is also sometimes referred to as a Logging System Transportation Plan (LSTP).

Log Transfer Facility (LTF)
A facility that is used for transferring commercially harvested logs to and from a vessel or log raft or the formation of a log raft. It is wholly or partially constructed in waters of the United States and siting and construction are regulated by the 1987 Amendments to the Clean Water Act; formerly termed "terminal transfer facility."

Long Term Roads
Roads developed and operated to provide either continuous or intermittent access for long-term land management and resource utilization needs.

Management Area
An area of one or more Value Comparison Units (VCUs) in size for which management direction was written in the Tongass Land Management Plan.

Management Indicator Species (MIS)
Species of vertebrates and invertebrates whose population changes are believed to best indicate the effects of land management. The following categories were used to select MIS: endangered and threatened plant and animal species identified on State and Federal lists; species with special habitat needs that may be influenced significantly by planned management programs; species commonly hunted, fished, or trapped; nongame species of special interest; additional plants or animals selected because their population changes are believed to indicate effects of management activities on other species of a major biological community or on water quality.

Management Prescriptions
Method of classifying land uses presented in the Tongass Land Management Plan (TLMP) Revision Draft EIS. Replaces the Land Use Designations (LUDs) presented in TLMP, as revised.

Marginal
Commercial forest land (CFL) areas that do not qualify as standard or special CFL since they are not operable under short-term (ten years or less) projections of accessibility and economic conditions.

Mass Failure
The downslope movement of a block or mass of soil. This usually occurs under conditions of high soil moisture and does not include individual soil particles displaced as surface erosion.

Mass Wasting
A general term for a variety of processes by which large masses of earth material are moved by gravity either slowly or quickly from one place to another. Also known as mass movement.

MBF
A thousand board feet net sawlog and utility volume.

Microblade
A specific type of small, thin blade tool with roughly parallel sides and a prepared proximal end. Often made from chert or obsidian.

Midden
A deposit of occupation debris, rubbish, or other by-products of human activity.

Middleground
The visible terrain beyond the foreground where individual trees are still visible but do not stand out distinctly for the landscape; area located from ¼ to 5 miles from the viewer. See also, Foreground and Background.

Mid-Market Analysis
The value and produce mix represented at the quarter in which the pond log value (end-product selling price less manufacturing cost) for the species and product mix most closely match the point between the ranked quarters of the Alaska Index Operation pond log value, adjusted to Common Year Dollars, where one-half of the harvest of timber from the Tongass National Forest has been removed at higher values and one-half of the timber has been removed at lower values during the period from 1979 to the current quarter (FSH 2409.22 R10 Chapter 531.1-2).

Mineral Soils
Soils consisting predominantly of, and having properties determined by, mineral matter.

Minimum Viable Population
The low end of the number of individuals of a species needed to ensure the long-term existence of the species.

Mining Claims
A geographic area of the public lands held under the general mining laws in which the right of exclusive possession is vested in the locator of a valuable mineral deposit.

Mitigation
Measures designed to counteract environmental impacts or to make impacts less severe. These measures may include avoiding an impact by not taking a certain

action or part of an action, minimizing an impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensating for the impact by replacing or providing substitute resources or environments.

MMBF
A million board feet net sawlog and utility volume.

MMCF
A million cubic feet net sawlog and utility volume.

Model
A representation of reality used to describe, analyze, or understand a particular concept. A model may be a relatively simple qualitative description of a system or organization, or a highly abstract set of mathematical equations. A model has limits to its effectiveness and is used as one of several tools to analyze a problem.

Monitoring
A process of collecting information to evaluate whether or not objectives of a project and its mitigation plan are being realized. Monitoring can occur at different levels: to confirm whether mitigation measures were carried out in the manner called for (Implementation Monitoring); to confirm whether mitigation measures were effective (Effectiveness Monitoring); or to validate whether overall goals and objectives were appropriate (Validation Monitoring). Different levels call for different monitoring methods.

Muskeg
In Southeast Alaska, a type of bog or fen that has developed over thousands of years in depressions or flat areas on gentle to steep slopes. Also called peatlands.

Mycorrhizae
A mutualism between plant roots and certain kinds of fungi. The plants exude carbon compounds to the fungi and the fungi provide the plants with soil nutrients, such as phosphorus.

Natal Streams
Home stream where an anadromous fish is hatched.

National Forest Management Act (NFMA)
A law passed in 1976 that amends the Forest and Rangeland Renewable Resources Planning Act that requires the preparation of Forest plans, Regional guides, and regulations to guide that development.

National Wild and Scenic River System
Rivers with outstanding scenic, recreational, geological, fish and wildlife, historic, cultural, or other similar values designated by Congress under the Wild and Scenic Rivers Act of 1968 and amended in 1986, for preservation of their free-flowing condition. May be classified and administered under one or more of the following categories: Wild, Scenic, and/or Recreational.

Native Allotment
A tract of nonmineral land, not to exceed 160 acres, on which an Alaska Native (who was 21 years of age or head of a household) established continuous use and occupancy prior to the creation of the National Forests (authorized under the Native Allotment Act of May 17, 1906).

Native Selection
Application by Native corporations and individuals to a portion of the Bureau of Land Management for conveyance of lands withdrawn in fulfillment of Native entitlements established under ANCSA.

Net Sawlog Volume
Trees suitable in size and quality for producing logs that can be processed into lumber. In Southeast Alaska, depending on the market, the volume may be processed as pulp or lumber.

No-Action Alternative
The most likely condition expected to exist in the future if current management direction were to continue unchanged.

Noncommercial Forest Land
Land with more than 10 percent cover of commercial forest tree species but not qualifying as commercial forest land (CFL).

Notice of Intent (NOI)
A notice printed in the Federal Register announcing that an EIS will be prepared. The NOI must describe the proposed action and possible alternatives, describe the agency's proposed scoping process, and provide a contact person for further information.

Offering
A Forest Service specification of timber harvest units, subdivisions, roads, and other facilities and operations to meet the requirements of a contract.

Offering Area
A geographic area identified by the Forest Service within which the offering specifications are outlined. One or more offering areas may be identified within all or a portion of a project area.

Off-Highway Vehicle (OHV)
Any vehicle that is restricted by law from operating on public roads for general motor vehicle traffic. Includes motorbikes, minibikes, trailbikes, snowmobiles, dunebuggies, all-terrain vehicles, and four-wheel drive, high-clearance vehicles (FSM 2355.01). Sometimes referred to as off-road vehicle or ORV.

Old-Growth Forest
A forest stand characterized by trees well past the age of maturity (dominant trees exceed 300 years on age). Stands exhibit declining growth rates and signs of decadence such as dead and dying trees, snags, and downed woody material. Stands include trees of all ages, multilayered canopies, a range of tree diameter sizes (including very large diameter trees up to and exceeding 3 meters), and the notable presence of understory vegetation. Old growth forests provide important habitat for Sitka black-tailed deer, marten, black bears, cavity-nesting birds, raptors, and other wildlife species.

Overmature
The stage at which a tree declines in vigor and soundness; for example, past the period of rapid height growth.

Overstory
The portion of trees in a forest that forms the uppermost layer of foliage, usually formed by the tallest trees. Also called the canopy.

Partial Cut
Method of harvesting trees (not clearcutting) where any number of live stems are left standing in any of various spatial patterns. Can include seed tree, salvage, group selection, shelterwood, shelterwood with reserves, overstory removal, or other methods.

Patch
A nonlinear surface area differing in appearance from its surroundings.

Peak Flow
The highest discharge of water recorded over a specified period of time at a given stream location.

pH
The degree of acidity or alkalinity.

Planning Record
A detailed, formal account of the planning process for an EIS. The record contains data, maps, reports, planning process information, and results of public participation in the planning process. The Planning Record documents the decisions and activities that resulted in the Final EIS. Planning records are available for public review upon request under the Freedom of Information Act.

Plant Association
Climax plant community type.

Podzol
A process of soil development characterized by: (1) rapid accumulation of organic material at the surface, followed by an accumulation of fine organic material at the top of the mineral soil horizons, (2) downward migration of nutrients, leaving a leached layer (often whitish in color) at the top of the mineral layer, and (3) in some areas, development of an impervious iron pan layer. Podzol development occurs in portions of the northern temperate zone, primarily in areas dominated by conifers.

Pond Value
The delivered price of logs at the mill minus the cost to manufacture them into usable products.

Population Viability
Ability of a population to sustain itself.

Precommercial Thinning
The practice of removing some of the trees of less than marketable size from a stand in order to achieve various management objectives.

Present Net Value
The difference between benefits and costs associated with the alternatives.

Proportionality
Section 301(c)(3) of the Tongass Timber Reform Act requires that harvest of high volume old-growth (volume classes 6 and 7) will not be at an accelerated rate. The Act requires that the proportion of harvest in volume classes 6 and 7 will not exceed the proportion of volume of these classes currently represented in a contiguous management area.

Public Participation
Meetings, conferences, seminars, workshops, tours, written comments, responses to survey questionnaires, and similar activities designed and held to obtain comments from the public about Forest Service activities.

Purchaser
The term used to describe the buyer of the Forest Service timber sale contract.

Rain-on-Snow Events
Term used to describe the rapid melting of snow during warm, windy periods of high rainfall which accounts for most high stream flows. These high flows have the greatest likelihood for causing significant effects through alteration of forest

hydrologic processes. This occurs through the influence of timber harvest on snow accumulation and melt during these events.

Record of Decision (ROD)
A document separate from, but associated with, an EIS that states the decision, identifies all alternatives, specifying which were environmentally preferable, and states whether all practicable means to avoid environmental harm from the alternatives have been adopted, and if not, why not.

Recreation Opportunity Spectrum (ROS)
The system for planning and managing recreation resources that categorizes recreation opportunities into six classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs based on the extent to which the natural environment has been modified, the type of facilities provided, the degree of outdoor skill needed to enjoy the area, and the relative density of recreation use. The classes are:

Primitive: An essentially unmodified natural environment of fairly large size. Interaction between users is very low, and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use is generally not permitted.

Semi-Primitive Nonmotorized: A natural-appearing environment of moderate to large site. Concentration of users is low, but there is often evidence of other users. The area is managed to minimize onsite controls and restrictions. Use of local roads for recreational purposes is not allowed.

Semi-Primitive Motorized: A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed to minimize onsite controls and restrictions. Local roads used for other resource management activities may be present.

Roaded Natural: A natural-appearing environment with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interactions between users may be moderate to high with evidence of other users prevalent. Motorized use is allowed.

Roaded Modified: A natural environment that has been substantially modified, particularly by vegetation manipulation. There is strong evidence of roads and/or highways. Frequency of contact is low to moderate.

Rural: A natural environment that has been substantially modified by development of structures and vegetative manipulation. Structures are readily apparent and may range from scattered to small dominant clusters. Sights and

sounds of humans are readily evident, and the interaction between users is often moderate to high.

Reforestation
The natural or artificial restocking of an area with trees.

Regeneration
The process of establishing a new crop of trees on previously harvested land.

Region
An area covered by a Forest Service regional guide. A region is generally composed of one or more national forests. Forest Service Region 10 includes the Tongass National Forest and the Chugach National Forest.

Regional Forester
The Forest Service official responsible for administering a single region.

Regional Guide
The guide developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended. It guides all natural resource management activities and establishes management standards and guidelines for the National Forest System lands within a given report.

Research Natural Area (RNA)
An area set aside by a public or private agency specifically to preserve a representative sample of an ecological community primarily for scientific and educational purposes. In Forest Service usage, RNAs are areas designated to ensure representative samples of as many major naturally occurring plant communities as possible.

Reserved
Lands that have been withdrawn from the timber base by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service.

Resident Fish
Fish that are not anadromous and that reside in fresh water on a permanent basis. Resident fish include non-anadromous Dolly Varden char and cutthroat trout.

Responsible Official
The Forest Service employee who has the delegated authority to make a specific decision.

Riparian Area
Transition zone between a stream or lake system and the adjacent land. Identified in part by soil characteristics or distinctive plant communities that require free or unbound water.

Road Card
A road card documents the interdisciplinary process that led to the location, access control, maintenance level, and road management objective for the final road location. The card includes a list of resource concerns and a picture of the road layout and surrounding terrain.

Roads

Arterial: Roads usually developed and operated for long-term land and resource management purposes to constant service (see specified road).

Collector: Collects traffic for a specific resource use activity such as a timber sale or recreational site, although other minor uses may be served (see specified road).

Local: A forest road that connect terminal facilities with forest collector, forest arterial, or public highways, usually forest local roads are single purpose transportation facilities (see specified road).

Temporary: For National Forest timber sales, temporary roads are constructed to harvest timber on a one-time basis. These logging roads are not considered part of the permanent Forest transportation network and have stream crossing structures removed, erosion measures put into place, and the road closed to vehicular traffic after harvest is completed.

Roadless Area
An area of undeveloped public land within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use.

Road Maintenance Level
The level of service provided by, and maintenance required for, a specific road consistent with road management objectives and maintenance criteria (FSH 7709.58, Section 12.3).

Maintenance Level 1: Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period is one year or longer. Basic custodial maintenance is performed.

Maintenance Level 2: Assigned to roads open for use by high-clearance vehicles. Passenger car traffic is not a consideration.

Maintenance Level 3: Assigned to roads open and maintained for travel by the prudent driver in a standard passenger car. User comfort and convenience are not considered priorities.

Maintenance Level 4: Assigned to roads that provide a moderate degree to user comfort and convenience at moderate travel speeds.

Maintenance Level 5: Assigned to roads that provide a high degree of user comfort and convenience. Normally, roads are double-laned and paved, or aggregate surfaced with dust abatement.

Road Management Objective (RMO)
Defines the intended purposes of an individual road based on Management Area direction and access management objectives. Road management objectives contain design criteria, operation criteria, and maintenance criteria. Only specified roads have RMOs.

Rotation
The planned number of years (approximately 100 years in Alaska) between the time that a Forest stand is regenerated and its next cutting at a specified stage of maturity.

Salvage Sale
A timber sale to use dead and downed timber and scattered poor-risk trees that would not be marketable if left in the stand until the next scheduled harvest.

Sawlog
That portion of a tree that is suitable in size and quality for the production of dimension lumber, collectively known as sawtimber.

Scheduled Timber Harvests
Timber harvests done as part of meeting the allowable sale quantity.

Scoping Process
Early and open activities used to determine the scope and significance of a proposed action, what level of analysis is required, what data are needed, and what level of public participation is appropriate. Scoping focuses on the issues surrounding the proposed action and the range of actions, alternatives, and impacts to be considered in an EA or an EIS.

Second-Growth Forest
Forest growth that has become established following some disturbance such as cutting, serious fire, or insect attack; even-aged stands that will grow back on a site after removal of the previous timber stand.

Seeding/Sapling Stage
The stage following timber harvest when most of the colonizing tree and shrub seedings become established. Usually 1 to 25 years.

Selection Cutting
The annual or periodic removal of trees (particularly mature trees), individually or in small groups, from an uneven-aged forest to realize the yield and establish a new crop of irregular constitution.

Sensitive Species
Plant and animal species that are susceptible or vulnerable to activity impacts or habitat alterations. Those species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species, that are on a nonofficial State list, or that are recognized by the regional forester as needing special management on National Forest lands to prevent placement on Federal or State lists.

Sensitivity Level
The measure of people's concern for the scenic quality of the National Forests. In 1980, the Tongass National Forest assigned sensitivity levels to land areas viewed from boat routes and anchorages, plane routes, roads trails, public use areas, and recreation cabins.

Level I: Includes all seen areas from primary travel routes, use areas, and water bodies where at least three-fourths of the forest visitors have a major concern for scenic quality.

Level II: Includes all seen areas from primary travel routes, use areas, and water bodies where at least one-fourth of the forest visitors have a major concern for scenic quality.

Level III: Includes all seen areas from secondary travel routes, use areas, and water bodies where less than one-fourth of the forest visitors have a major concern for scenic quality.

Shelterwood with Reserves
Harvesting in one cut area that has shelter trees remaining on the site for purposes other than regeneration of the new stand. This type of cut provides benefits for wildlife, soils, and visual concerns. Reserve trees are culls with little or no commercial value. The amount remaining is 10-50 percent of the MBF within the unit.

Short-Term Facility
A facility developed and operated for a limited period of time which will cease to exist as a transportation facility after the purpose for which it was constructed is

completed, and the occupied land is reclaimed and managed for natural resource purposes.

Significant
Specific legal term under the National Environmental Policy Act that requires considerations of both context and intensity in evaluating impacts.

Silviculture
The science of controlling the establishment, composition, and growth of forests.

Site Preparation
Manipulation of the vegetation or soil of an area prior to planting or seeding. The manipulation follows harvest, wildfire, or construction in order to encourage the growth of favored species. Site preparation may include the application of herbicides burning, or cutting of living vegetation that competes with the favored species; tilling the soil; or burning of organic debris (usually logging slash) that makes planting or seeding difficult.

Slash
Debris left over after a logging operation; i.e., limbs, bark, broken pieces of logs.

Smolt
Young salmon or trout that move from freshwater streams to saltwater.

Snag
A standing dead tree, usually greater than 5 feet tall and 6 inches in diameter at breast height. Often used by varied wildlife species as a roosting, perching, or feeding site, as well as providing potential habitat for species such as those that nest inside excavated cavities.

Soil Hazard Classes
Classification of soils based on their potential for landslides and mass wasting.

> ***Stability Class I - Low Hazard.*** These areas have the least probability for landslides. Most of these areas occur on slopes that are less than 35 percent.
>
> ***Stability Class II - Moderate Hazard.*** These areas are generally stable in an undisturbed condition, and rarely show evidence of past failures or instability. The slopes generally range from 35 to about 70 percent.
>
> ***Stability Class III - High Hazard.*** These areas show evidence of past failure. Scars of old soil failures remain visible; however there is minimal evidence of recent failures. Most of the historical failures originated on very steep slopes (greater than 70 percent), and many of the debris chutes extend well down into the more gently sloping valley bottoms.

Stability Class IV - Very High Hazard. These soils show evidence of frequent past failures, as well as recent failures. The failures occurred under natural conditions (unharvested and unroaded forestland). Most of these failures appear to be shallow types of events, that originated on steep or very steep slopes greater than 70 percent.

Soil Productivity
Capacity of soil to produce plant growth due to the soil's chemical, physical, and biological properties.

Soil Texture
Relative amounts of sand, silt, and clay in a soil. Coarse-textured soils are generally considered sandy and often contain gravel of various sizes. Fine-textured soils are considered very fine, sandy, silty, or clayey.

Specified Roads (also see roads)
Those forest development roads planned for future recurrent land management uses and for which the timber sale contract specifies the location, standards, service life, and design specifications.

The following are definitions of service life:

Long Term Roads
Roads developed and operated to provide continuous access for long-term land management and resource utilization needs.

Intermittent Roads
A road developed and operated for periodic service and closed for more than one year between periods of use.

Short Term Roads
A road developed and operated for a limited period of time which will cease to exist as a transportation facility after the purpose for which it was constructed is completed, and the occupied land is reclaimed and managed for natural resource purposes.

Stand (Tree Stand)
A group of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition as to be distinguishable from the forest in adjoining areas.

Standard
A course of action or level of attainment required by the Forest Plan to promote achievement of goals and objectives.

State Historic Preservation Officer (SHPO)
State appointed official who administers Federal and State programs for cultural resources.

State Selection
Application by Alaska Department of Natural Resources to the Bureau of Land Management for conveyance of a portion of the 400,000-acre State entitlement from vacant and unappropriated National Forest System lands in Alaska under the Alaska Statehood Act.

Station
Engineer term representing 100 feet.

Stream Classes
See Aquatic Habitat Management Unit

Stream Order
First order streams are the smallest unbranched tributaries; second order streams are initiated by the point where two first order streams meet; third order streams are initiated by the point where two second order streams meet, and so on.

Structural Diversity
The diversity of forest structure, both vertically and horizontally, that provides for a variety of forest habitats such as logs and multilayered forest canopy for plants and animals.

Stumpage
The value of timber as it stands uncut in terms of dollar value per thousand board feet.

Subsistence Use
The customary and traditional uses by rural Alaskan residents of wild renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter or sharing, for personal or daily consumption; and for customary trade.

Subsistence Use Area
Important Subsistence Use Areas include the "most reliable" and "most often hunted"categories from the Tongass Resource Use Cooperative Survey (TRUCS) and from subsistence survey data from ADF&G, the University of Alaska, and the Forest Service-Region 10. Important use areas include both intensive and extensive use areas for subsistence harvest of deer, furbearers, and salmon.

Substantive Comment
A public comment that provides factual information, professional opinion, or informed judgement germane to the action being proposed.

Succession
The ecological progression of community change over time, characterized by displacements of species leading to a relatively stable climax community.

Suitable
Commercial forest land identified as having both the biological capability and availability to produce industrial wood products.

Sustained Yield
The amount of renewable resources that can be produced continuously at a given intensity of management.

Temporary Roads
See Roads.

Tentatively Suitable Forest Land
Forest land that is producing, or is capable of producing, crops of industrial wood and (a) has not been withdrawn by Congress, the Secretary of Agriculture, or the Chief of the Forest Service; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils productivity or watershed conditions; (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that it is possible to restock adequately within 5 years after final harvest; and (d) adequate information is available to project responses to timber management activities.

Thousand Board Foot Measure (MBF)
A method of timber measurement equivalent to 1,000 square feet of lumber one inch thick.

Threatened Species
A species of plant or animal likely to become endangered within the foreseeable future throughout all or a significant portion of its range, as defined in the Endangered Species Act of 1973, and which has been designated in the Federal Register by the Secretary of the Interior as a threatened species. (See also Endangered Species and Sensitive Species.)

Tiering
Eliminating repetitive discussion of the same issue by incorporating by reference. The general discussion in an EIS of broader scope; e.g., this document is tiered to TLMP, as amended.

Timber Appraisal
Establishing the fair market value of timber by taking the selling value minus manufacturing costs, the cost of getting logs from the stump to the manufacturer, and an allowance for profit and risk.

Timber Classification
Forested land is classified under each of the land management alternatives according to how it relates to the management of the timber resource. The following are definitions of timber classifications used for this purpose.

Nonforest: Land that has never supported forests and land formerly forested where use for timber production is precluded by development or other uses.

Forest: Land at least 10 percent stocked (based on crown cover) by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.

Suitable or Suitable Available: Land to be managed for timber production on a regulated basis.

Unsuitable: Forest land withdrawn from timber use by statute or administrative regulation (for example, wilderness), or identified as inappropriate for timber production in the forest planning process.

Commercial Forest: Forest land tentatively suitable for the production of continuous crops of timber and that has not been withdrawn.

Timber Entry
A term used to refer to how far into the timber rotation an area is on the basis of acreage harvested. For example, if an area is being managed for 3 entries over a 100-year rotation, the first entry would be completed when one-third (approximately 33 percent) of the available acreage is harvested (usually in 30 to 40 years); the second entry would be completed when two-thirds (approximately 66 percent) of the available acreage is harvested (usually 60 to 70 years); the third entry would be completed when all of the available acreage is harvested (at the end of the rotation).

Timber Production
The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use.

Timber Volume Class
Used to describe the average volume of timber per acre in thousands of board feet (MBF). The seven volume classes include:

Class 3: Less than 8 MBF/acre (cleared land, seedlings, or pole timber stands).

Class 4: 8 to 20 MBF/acre.

Class 5: 20 to 30 MBF/acre.

Class 6: 30 to 50 MBF/acre.

Class 7: 50+ MBF/acre.

TLMP Land Use Designation (LUD)
The method of classifying land uses presented in the Tongass Land Management Plan (TLMP). Land uses and activities are grouped to define, along with a set of coordinating policies, a compatible combination of management activities. The following is a description of the four classifications in the current Forest Plan (TLMP 1979a, as amended):

LUD I: Wilderness areas.

LUD II: These lands are to be managed in a roadless state to retain their wildland character, but this designation would permit wildlife and fish habitat improvements, as well as primitive recreation facility and road development under special authorization.

LUD III: These lands may be managed for a variety of uses. The emphasis is on managing for uses and activities in a compatible and complimentary manner to provide the greatest combination of benefits.

LUD IV: These lands provide opportunities for intensive resource use and development where the emphasis is primarily on commodity or market resources.

TLMP Draft Revision Land Use Designations (Existing in Project Area)
Beach Fringe and Estuary (BF): Natural beach fringe and estuary habitats are managed to favor wildlife, fish, recreation, visual , and other resources associated with beach fringe and estuary areas. Areas included are 500 feet from beaches and 1,000 feet from estuaries. These areas are managed in near-natural, undisturbed habitat conditions. Timber harvest is not allowed and cutting on the upland is discouraged; if allowed, it is limited to designated areas. Beach Fringe and Estuary areas are contained within other LUDs.

Stream and Lake Protection (Riparian Areas)(SL): Under this LUD, areas comprised of aquatic and riparian ecosystems, including riparian streamsides, lakes, and floodplains, are designated for protection. These areas provide diverse habitat for upland- and riparian-associated species. Commercial

timber harvest is prohibited within a minimum of 100 feet of all Class I streams and those Class II streams that flow directly into Class I streams. Roads are to be located outside of these areas to the extent practicable. Transportation developments should not impair the production and migration of anadromous fish. Stream and Lake Protection areas are contained within other LUDs.

Scenic Viewshed (SV): These LUDs are managed to provide scenic landscapes, vistas, and travel corridors in areas viewed by the public mainly from roads, recreational sites, and waterways. Timber harvest is allowed as long as it complies with visual standards and guidelines. Roads and trails must be compatible with the natural landscape.

Modified Landscape (ML): Modified Landscape LUDs provide a mix of management options, while minimizing the visibility of development activities. Timber harvest and road construction must be designed to retain visual quality and recreational opportunities.

Timber Production (TM): The primary purpose of TM areas is to maintain and promote industrial wood production. Timber production activities will be designed to consider fish and wildlife habitat and recreational opportunities. Timber harvest may include both even- and uneven-aged silvicultural methods. The use of a specific silvicultural method will depend on the ecological characteristics of each stand and the stand location.

Experimental Forests (EF): Experimental Forests (i.e., Maybeso Experimental Forest) provide a variety of long-term opportunities for forest research. Timber harvest and road construction is allowed for research and demonstration purposes.

Research Natural Area (RA): These areas are managed for research and education and/or to maintain natural diversity on National Forest System lands. No timber harvest is permitted.

Tongass Land Management Plan (TLMP)
The 10-year land allocation plan for the Tongass National Forest that directs and coordinates planning and the daily uses and activities carried out within the forest.

Tongass Resource Use Cooperative Survey (TRUCS)
A compilation of data on subsistence uses for evaluating the effects of the proposed action in this EIS.

Turbidity
An indicator of the amount of suspended sediments in water.

6 Glossary

Understory
The trees and shrubs in a forest growing under the main crown canopy or overstory.

Uneven-Aged Management
The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular size to retain within each area, thereby maintaining a planned distribution of size classes.

Unit Design Card
The unit design card documents the interdisciplinary process that led to the location and final shape for the unit. The card documents the interdisciplinary process, describes resource concerns, and includes a map of the unit and surrounding terrain.

Unsuitable
Forest land withdrawn from timber use by statute or administrative regulation (e.g., wilderness), or identified as not appropriate for timber production in the forest planning process.

Utility Logs
Those logs that do not meet sawlog grade but are suitable for production of firm, usable pulp chips.

Value Comparison Unit (VCU)
Areas that generally encompass a drainage basin containing one or more large stream systems; boundaries usually follow easily recognizable watershed divides. Established to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

Viable Population
The number of individuals in a species required to ensure the continued long-term existence of the population in natural, self-sustaining populations and adequately distributed throughout the region.

Viewshed
An expansive landscape or panoramic vista seen from a road, marine waterway, or specific viewpoint.

Visual Absorption Capability
An estimate of the relative ability of the landscape to accept management manipulations without significantly affecting its visual character. The three VAC categories are:

Intermediate VAC: Intermediate ability to accept management alterations without significantly affecting the visual character due to moderate landscape complexity.

Low VAC: Limited ability to accept management alterations without significantly affecting the visual character due to low landscape complexity.

High VAC: Greatest ability to accept management alterations without significantly affecting visual character due to high landscape complexity.

Visual Management Classes (VMC)
Qualitative descriptions used in project planning to indicate the relative ease or difficulty that may be required to meet the visual quality objectives for an area. VMCs include:

Class 1: Management activities are not evident or are not evident to the casual observer.

Class 2: Management activities are sometimes evident, but are designed to be visually subordinate to natural landscape character.

Class 3: Management activities are clearly evident and sometimes dominate landscape character, but are designed to appear similar to natural occurrences.

Class 4: Management activities clearly dominate natural landscape character, but are designed to appear as natural occurrences when viewed as background.

Visual Management System
A program developed by the Forest Service to identify the visual characteristics of the forest landscape and analyze in advance the visual effects of resource management actions.

Visual Quality Objective (VQO)
Measurable standards reflecting five different degrees of landscape alteration based upon a landscape's diversity of natural features and the public's concern for high scenic quality. The five categories of VQOs are:

Preservation: Permits ecological changes only. Applies to wilderness areas and other special classified areas.

Retention: Provides for management activities that are not visually evident; requires reduction of contrast through mitigation measures either during or immediately after operation.

Partial Retention: Management activities remain visually subordinate to the natural landscape. Mitigation measures should be accomplished within one year of project completion.

Modification: Management activities may visually dominate the characteristics landscape. However, activities must borrow from naturally established form, line, color, and texture so that its visual characteristics resemble natural occurrences within the surrounding area when viewed in the middleground distance.

Maximum Modification: Management activities may dominate the landscape. Mitigation measures should be accomplished within five years of project completion.

V-notch
A deeply cut valley along some waterways, generally in steep, mountainous terrain, that would look like a "V" from a frontal view.

Volume
Stand volume based on standing net board feet per acre by Scribner Rule.

Watershed
That area that contributes water to a drainage or stream; portion of a forest in which all surface water drains to a common point. Can range from a few tens of acres that drain a single small intermittent stream to many thousands of acres for a stream that drains hundreds of connected intermittent and perennial streams.

Wetland
Areas that are inundated by surface or groundwater frequently enough to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mudflats, and natural ponds.

Wild and Scenic Rivers
Rivers or sections of rivers designated by congressional actions under the 1968 Wild and Scenic Rivers Act, as wild, scenic, or recreational by an act of the Legislature of the State or States through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories:

Recreational River Areas: Rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Scenic River Areas: Rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Wild River Areas: Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Wilderness
Areas designated under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions. In Alaska, wilderness also has been designated by TTRA and ANILCA.

Wildlife Analysis Area (WAA)
Alaska Department of Fish and Game administrative designation of an area that includes one or several Value Comparison Units (VCUs) for wildlife analysis and regulating wildlife populations.

Wildlife Habitat
The locality where a species may be found and where the essentials for its development and sustained existence are obtained.

Wildlife Habitat Management Unit (WHMU)
An area of wildlife habitat identified during the ID Team process as having values important to wildlife.

Windfirm
Configuration of harvest units so as not to create an opening which exposes the adjacent stand of timber to the direction of the major prevailing storm wind (southeast).

Windthrow
The act of trees being uprooted, blown down, or broken off by storm winds. Three types of windthrow include: endemic, where individual trees are blown over; catastrophic, where a major windstorm can destroy hundreds of acres; and management related, where the clearing of trees in an area makes the adjacent standing trees vulnerable to windthrow.

Winter Range
An area, usually at lower elevation, used by big game during the winter months.

Withdrawal
The withholding of an area of Federal land from settlement, sale, location, or entry under some or all of the general land laws of the purposes of limiting activities under those laws to maintain other public values in the area.

Yarding
Hauling timber from the stump to a collection point.

Yield Tables
Tables that estimate the level of outputs that would result from implementing a particular activity. Usually referred to in conjunction with FORPLAN input or output. Yield tables can be developed for timber volumes, range production, soil and water outputs, and other resources.

Chapter 7

Distribution List

Distribution List

Agencies, Organizations, and Persons to Whom Copies of the EIS were Sent

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AK Department of Highways
AK Dept of Commerce & Econ. Develop, Office of the Commissioner
AK Dept of Commerce & Econ. Develop, Division of Economic Development
AK Dept of Community & Regional Affairs
AK Dept of Environ Conservation

AK Dept of Fish & Game, Division of Wildlife Conservation
AK Dept of Fish & Game, Division of Subsistence, Juneau, AK
AK Dept of Fish & Game
AK Dept of Natural Resources, Division of Subsistence, Douglas, AK
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AK Dept of Natural Resources, State Historic Preservation Officer
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AK Dept of Natural Resources, Division of Natural Resources
AK Dept of Natural Resources-Land Regional Manager
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KIFW AM/KSBZ FM Radio
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Kim Hastings
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KJNO 630/FM 105TAKU
KJUD Television/KSUP Radio
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Kristian Erickson
KRSA Radio
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USDA Soil Conservation Service
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Chapter 8

List of Preparers

Chapter 8

List of Preparers

Charles W. Barber, Timber Economist Task Leader, Silviculturist

B.S. Forest Management
Licensed Forester - California
Registered Appraisal Assistant - Oregon

Years of Experience

Atterbury: 5 Other: 15

Peter M. Bowers, Cultural Resources Task Leader

M.A. Anthropology
B.A. Anthropology

Years of Experience

Northern Land Use Research: 5 Other: 16

Jon Boyce, Assistant Project Manager, Recreation Task Leader

M.A. Geography/Resource Planning
B.S. Environmental Studies

Years of Experience

Parametrix, Inc.: 7 Other:9

Matthew Boyle, Subsistence Task Leader

B.S. Wildlife Biology

Years of Experience

Parametrix, Inc.: 1 Other: 9

8 List of Preparers

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M.S. Aquatic Ecology
B.S. Forest Management
Certified Watershed Analyst

Years of Experience
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M.A. Biology
B.S. Wildlife Science (Forest Resources)
Certified Ecologist - Ecological Society of America
Habitat Evaluation Procedure Certified

Years of Experience
Parametrix, Inc.: 3 years Other: 17 years

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M.S. Forestry
B.S. Forestry
Registered Professional Engineer - Washington, Oregon

Years of Experience

Logging Engineering International: 14 Other: 16

Jeff Jenkins, Forester, Timber Task Leader

B.S. Forest Management

Years of Experience

Atterbury: 7 Other:12

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Ph.D. Aquatic Ecology
M.S. Plant Ecology and Taxonomy
B.S. Botany
Certified Ecologist - Ecological Society of America

Years of Experience
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M.S. Forest Management
B.S. Forestry
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Years of Experience

Independent Consultant: 2   Other: 34

Phil McColley, Soils Scientist

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Certified Professional Soil Scientist

Years of Experience

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Tracey P. McKenzie, Marine Task Leader

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B.S. Biology

Years of Experience
Parametrix, Inc.:3   Other:10

8 List of Preparers

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B.S. Geology
Registered Professional Geologist - Oregon

Years of Experience

Parametrix, Inc.:3 Other:13

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B.A. Mathematics

Years of Experience

Parametrix, Inc.:3 Other:2

Janis Snoey, Visuals Resources Task Leader

B.L.A. (Landscape Architecture)
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Years of Experience

Atelier: 5 Other: 12

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B.S. Mathematical Sciences

Years of Experience

Parametrix, Inc.:4 Other:5

Thomas R. Strong, Ph.D., Karst Task Leader

Ph.D. Biology
M.S. Chemical Engineering
B.S. Chemical Engineering

Years of Experience

Parametrix, Inc.:3 Other:9

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